

Plumbing Installation

Level-IV

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Acronyms

AWWA	American Water Works Association
ASSE	Search Engine Optimization
ASPE	American Society of Plumbing Engineers
OHS	Occupational Health and Safety
ASTM	American Society for Testing and Materials
HVAC	Heating, Ventilation, and Air Conditioning
BIM	Building Information Modeling
PVB	Pressure vacuum breakers
RPZ	Reduced pressure zone
DCV	Double check valves
DCVA	Double Check Valve Assembly
BPD	Backflow prevention devices
IAPMO	International Association of Plumbing and Mechanical Officials

Introduction to Module

Conducting onsite supervision of a building plumbing installation project is crucial to ensure that the plumbing system is installed correctly and meets all necessary standards and regulations. This process involves overseeing the installation, coordinating with contractors and workers, and ensuring that the project progresses smoothly. In this comprehensive guide, we will discuss the key steps and considerations involved in conducting onsite supervision of a building plumbing installation project.

This module is designed to meet the industry requirement under the plumbing occupational standard, particularly for the unit of competency: Conducting onsite supervision of a building plumbing installation project

This Module Covers the Units

- Planning and preparing for work.
- Testing and commissioning requirements.
- Testing and commission device.
- Maintaining device and restore work area.

Learning Objective of the Module

- Plan and Prepare for work.
- Identify testing and commissioning requirements.
- Test and commission device.
- Maintain device and restore work area.

Module Instruction

For effective use this modules trainees are expected to follow the following module instruction:

1. Read the information written in each unit
2. Accomplish the Self-checks at the end of each unit
3. Perform Operation Sheets which were provided at the end of units and
4. Read the identified reference book for Examples and exercise

Unit One: Supervise the administration of claims and payment processes

This unit is developed to provide you the necessary information regarding the following content coverage and topics:

- Obtaining drawings and specifications
- Adhering Safety (OHS) environmental requirements
- Identifying and adhering Quality assurance requirements
- Planning and sequencing Tasks
- Selecting, checking and maintaining backflow prevention devices
- Preparing Work area

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Obtain drawings and specifications
- Adhere Safety (OHS) environmental requirements
- Identify and adhere Quality assurance requirements
- Plan and sequence Tasks
- Select, check and maintain backflow prevention devices
- Prepare Work area

1.1. Drawings and specifications

The drawings and specifications are meant for the assistance and guidance of the Plumbing and Sanitary Nominated Contractor, and exact location, distance and levels will be governed by the individual building and site conditions. Therefore, approval of the Client Architects Consultants shall be obtained before commencement of work on the following:

- Exact run and sizes of all piping on all floors and vertical stacks.
- Location of all mechanical equipment with layout and piping connections.
- Ground and invert levels of all drainage pipes together with location of all manholes and connections up to outfall.
- Run of all water supply lines with diameters, location of control valves, access panels.
- Location of all mechanical equipment with layout and piping connections.

1.1.1. Classes of Drawings and Specifications

Backflow prevention devices are essential components of plumbing systems to prevent the reversal of water flow into the potable water supply. Commissioning and maintaining these devices require careful planning, execution, and documentation. This answer will provide an in-depth explanation of the classes of drawings and specifications for commissioning and maintaining backflow prevention devices.

Classes of Drawings

- A. Site Plan Drawings:** These drawings provide a comprehensive overview of the plumbing system, including the location of backflow prevention devices, piping, and other relevant features. Site plan drawings are essential for identifying potential risks and ensuring that the devices are installed in the correct location.
- B. Piping and Control Diagrams:** These diagrams provide a detailed view of the piping and control systems, including the connections, valves, and other components. Piping and control diagrams are crucial for understanding the flow of water and the operation of the backflow prevention devices.
- C. Device Installation Drawings:** These drawings provide detailed instructions for the installation of backflow prevention devices, including the location of the devices, the

connections to the piping, and any other relevant information. Device installation drawings are essential for ensuring that the devices are installed correctly and function properly.

- D. **Testing and Maintenance Procedures:** These drawings provide detailed instructions for testing and maintaining backflow prevention devices, including the procedures for testing the devices, the frequency of testing, and any other relevant information. Testing and maintenance procedures are essential for ensuring that the devices function properly and prevent backflow.

Classes of Specifications

- A. **Materials:** Backflow prevention devices must be made of materials that are resistant to corrosion and durable enough to withstand the pressure and flow of water. The materials used in the devices must meet the standards set by the American Society for Testing and Materials (ASTM) and the International Association of Plumbing and Mechanical Officials (IAPMO).
- B. **Design and Construction:** The design and construction of backflow prevention devices must meet the standards set by the AWWA and the ASSE. The devices must be designed to prevent backflow and must be constructed with components that are easy to maintain and repair.
- C. **Testing and Certification:** Backflow prevention devices must be tested and certified to ensure that they function properly and meet the standards set by the AWWA and the ASSE. The testing and certification process must be conducted by a qualified professional and must be documented in the device's manual.
- D. **Installation and Maintenance:** The installation and maintenance of backflow prevention devices must be performed by a qualified professional. The installation and maintenance procedures must be documented in the device's manual and must meet the standards set by the AWWA and the ASSE.

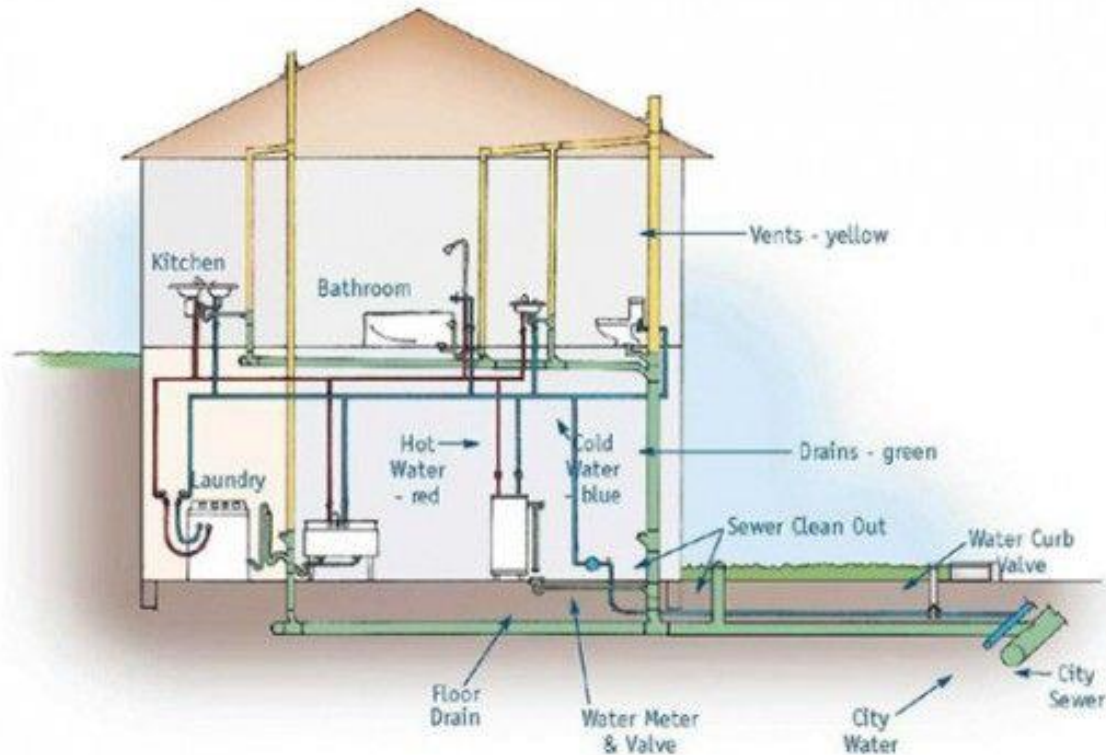


Figure1.3. pipe class and piping specification in building

1.1.4. Importance of Drawings and Specifications

Drawings and specifications play a vital role in both commissioning and maintaining a backflow prevention device. Here's why they are important:

- A. **Accuracy and Precision:** Drawings and specifications provide precise instructions for installation, ensuring that the backflow prevention device is correctly positioned, aligned, and connected within the plumbing system. This accuracy is crucial for the device to function effectively in preventing backflow.
- B. **Compliance with Regulations:** Backflow prevention devices must meet specific regulatory requirements to ensure public health and safety. Drawings and specifications help ensure compliance by providing guidelines for design, installation, and maintenance that align with these regulations.
- C. **Reference for Maintenance:** Drawings and specifications serve as a reference point during maintenance activities. They provide essential information about the device's components, connections, and operating parameters, helping maintenance personnel identify and address any issues effectively.

1.2. Occupational health and Safety (OHS)

Occupational health and safety (OHS) plays a crucial role in commissioning and maintaining backflow prevention devices. Backflow prevention devices are essential in preventing the contamination of potable water supplies by ensuring that water flows in one direction only. These devices are commonly used in various settings, including residential, commercial, and industrial facilities.

During the commissioning process, several OHS considerations should be taken into account to ensure the safety of workers involved.

- provide appropriate training and education
- risk assessment should be conducted
- ensure that all equipment used is regularly inspected and maintained.

1.3. Quality Assurance Requirements

Quality assurance requirements refer to the set of criteria, processes, and activities that ensure the delivery of high-quality products or services. These requirements are essential for organizations to meet customer expectations, comply with industry standards, and maintain a competitive edge in the market.

This comprehensive guide will outline the key quality assurance requirements for commissioning and maintaining backflow prevention devices:

Commissioning Requirements

- A. **Testing:** Conduct functional testing of backflow prevention devices to ensure they are operating correctly. This includes pressure tests, flow tests, and leakage tests.
- B. **Calibration:** Calibrate backflow prevention devices to ensure they are accurately measuring pressure and flow rates.
- C. **Documentation:** Maintain detailed documentation of commissioning activities, including test results and calibration records.
- D. **Training:** Provide training to operators and maintenance personnel on the proper operation and maintenance of backflow prevention devices.

Maintenance Requirements

- A. **Regular Inspections:** Conduct regular inspections of backflow prevention devices to ensure they are in good working condition.
- B. **Repair and Replacement:** Repair or replace backflow prevention devices as needed to maintain their effectiveness.
- C. **Cleaning and Flushing:** Clean and flush backflow prevention devices regularly to prevent sediment buildup and ensure proper function.
- D. **Potable Water Testing:** Test potable water sources for contaminants and ensure that backflow prevention devices are functioning correctly to prevent contamination.

1.4. Planning and sequencing Tasks

Planning and sequencing Tasks in commissioning and maintaining a series of tasks that need to be planned and sequenced properly to ensure the effectiveness and reliability of these devices. This process is crucial in preventing the contamination of potable water supply systems.

Planning Tasks:

1. **Identify the scope:** The first step in planning is to identify the scope of the project. This includes determining the number and types of backflow prevention devices that need to be commissioned and maintained, as well as understanding any specific requirements or regulations that apply.
2. **Assess system requirements:** It is important to assess the system requirements for each backflow prevention device. This includes understanding the water pressure, flow rate, and potential hazards that may be present in the system.
3. **Determine device specifications:** Based on the system requirements, appropriate backflow prevention devices need to be selected. This involves considering factors such as device type, size, and compatibility with the existing plumbing system.
4. **Develop a commissioning plan:** A commissioning plan should be developed to outline the specific tasks and procedures that will be followed during the commissioning process. This plan should include details on testing methods, documentation requirements, and any necessary training for personnel involved.

5. Coordinate with stakeholders: It is important to coordinate with all relevant stakeholders, including facility owners, plumbers, and regulatory authorities. This ensures that everyone is aware of their roles and responsibilities throughout the commissioning and maintenance process.

Sequencing Tasks:

1. Pre-installation inspection: Before installing a backflow prevention device, it is important to conduct a thorough inspection of the plumbing system. This includes checking for any existing cross-connections or potential sources of contamination.

2. Installation: The backflow prevention device should be installed according to manufacturer guidelines and local regulations. This may involve cutting into existing pipes, soldering or gluing fittings, and ensuring proper alignment and sealing.

3. Testing and certification: Once the device is installed, it should be tested to ensure its proper functioning. This typically involves conducting a series of tests, such as a differential pressure test or a simulated backflow test. If the device passes the tests, it can be certified for use.

4. Documentation: Proper documentation is essential throughout the commissioning and maintenance process. This includes keeping records of installation details, test results, and any repairs or modifications made to the device.

5. Regular maintenance: Backflow prevention devices require regular maintenance to ensure their continued effectiveness. This may include periodic inspections, cleaning, and calibration of pressure-reducing valves or check valves.

6. Emergency repairs: In the event of a malfunction or failure of a backflow prevention device, emergency repairs should be carried out promptly to prevent any contamination of the potable water supply system.

1.5. Selecting, checking and maintaining backflow prevention devices

Backflow prevention devices are an essential component of many plumbing systems, and selecting, checking, and maintaining them is critical to ensure the continued effectiveness of the system.

Some key considerations when selecting, checking, and maintaining backflow prevention devices

1.5.1. Selecting Backflow Prevention Devices

It is important to consider several factors to ensure that the device meets the specific needs of the plumbing system.

Some key considerations include:

- A. Application:** In selecting backflow prevention device is to determine the specific application for which it will be used. Different types of devices are designed for different applications, such as irrigation systems, fire suppression systems, or drinking water systems.
- B. Flow Rate:** The flow rate of the fluid being protected is another important consideration. The backflow prevention device must be capable of handling the maximum flow rate of the fluid to ensure proper protection.
- C. Pressure:** The pressure drop across the device should also be considered. The device should be able to handle the pressure drop without losing its ability to prevent backflow.
- D. Materials:** The materials used in the construction of the device are also important. The device should be made of durable materials that can withstand the conditions of the application.
- E. Certification:** It is important to select a device that has been certified by a recognized third-party testing organization, such as NSF International or UL (Underwriters Laboratories). This ensures that the device meets industry standards for performance and safety.

1.5.2. Maintenance of Backflow Prevention Devices

Regular maintenance is essential to ensure the continued effectiveness of the backflow prevention device. Some key maintenance tasks include:

- A. Testing:** The device should be tested regularly to ensure that it is functioning properly. Testing may involve simulating a backflow condition and measuring the response of the device.
- B. Cleaning:** The device should be cleaned regularly to remove any debris or sediment that may accumulate. Cleaning may involve flushing the device with water or using a specialized cleaning solution.
- C. Repair:** Any repairs or replacements should be performed promptly to ensure the continued effectiveness of the device.

1.5.3. Checking of Backflow Prevention Devices

In addition to regular maintenance, it is also important to check the device periodically to ensure that it is functioning properly. Some key checks include:

- A. Visual Inspection:** The device should be visually inspected regularly to ensure that there are no signs of damage or wear.
- B. Functional Testing:** The device should be functionally tested periodically to ensure that it is responding correctly to backflow conditions.
- C. Documentation:** Proper documentation of the backflow prevention device is essential to ensure compliance with regulations and to provide a record of maintenance and testing. Some key documents include:
- D. Installation Records:** A record of the installation of the device should be kept, including the date of installation and the name of the installer.
- E. Maintenance Records:** A record of all maintenance and testing activities should be kept, including the date of each activity and the results of any tests.

Inspection Reports

Any inspection reports or other documentation related to the device should be kept on file.

1.6. Preparing Work area

Preparing the work area in commissioning and maintaining backflow prevention devices is an essential step to ensure the proper functioning and longevity of these devices. It involves several important considerations to create a safe and efficient working environment. In this comprehensive response, we will discuss the various steps involved in preparing the work area for commissioning and maintaining backflow prevention devices.

1.6.1. Assessing the Work Area:

Before starting any work, it is crucial to assess the work area thoroughly. This assessment helps identify potential hazards, determine the necessary tools and equipment, and plan for any required safety measures. Some key aspects to consider during the assessment include:

- A. Access and Space:** Ensure that there is sufficient space to work comfortably around the backflow prevention device. This includes having enough room for tools, equipment, and personnel to move freely without any obstructions.
- B. Safety Hazards:** Identify any potential safety hazards such as electrical connections, sharp objects, or slippery surfaces. Take necessary precautions to eliminate or minimize these hazards before starting the work.

- C. **Environmental Factors:** Consider environmental factors like temperature, humidity, and ventilation. Some backflow prevention devices may require specific environmental conditions for optimal performance.
- D. **Isolation:** Determine if isolation of the device from the main water supply is necessary during maintenance or commissioning. If so, ensure that appropriate valves are available to isolate the device effectively.

1.6.2. Gathering Tools and Equipment:

Once the work area has been assessed, gather all the necessary tools and equipment required for commissioning and maintaining backflow prevention devices. The specific tools needed may vary depending on the type of device being worked on, but some common tools include:

- A. **Wrenches:** Different sizes of adjustable wrenches or pipe wrenches may be required to loosen or tighten connections.
- B. **Pressure Gauges:** Pressure gauges are used to measure water pressure before and after the backflow prevention device.
- C. **Test Kits:** Backflow prevention devices often require periodic testing. Test kits containing gauges, hoses, and other accessories are used to perform these tests accurately.
- D. **Cleaning Tools:** Brushes, pipe cleaners, and other cleaning tools may be needed to remove debris or sediment from the device.
- E. **Personal Protective Equipment (PPE):** Depending on the specific work area and potential hazards identified during the assessment, appropriate PPE such as gloves, safety glasses, or protective clothing should be worn.

1.6.3. Implementing Safety Measures:

Safety should always be a top priority when working with backflow prevention devices. Implementing appropriate safety measures helps prevent accidents and ensures the well-being of personnel involved in the maintenance or commissioning process. Some essential safety measures include:

Lockout/Tag out Procedures: If isolation of the device is required, follow proper lockout/tag out procedures to ensure that it is safely disconnected from the water supply and cannot be accidentally reconnected.

Proper Ventilation: If working in an enclosed space, ensure adequate ventilation to prevent the buildup of harmful gases or fumes.

Electrical Safety: If electrical connections are present near the work area, take necessary precautions to avoid electrical hazards. This may include turning off power sources or using appropriate insulation for electrical components.

Proper Lifting Techniques: When moving heavy equipment or tools, use proper lifting techniques to prevent strain or injury. Seek assistance if needed.

Emergency Preparedness: Have emergency response procedures in place and ensure that all personnel involved are aware of these procedures. This includes knowing the location of emergency exits, fire extinguishers, first aid kits, and other safety equipment.

Self-Check 1

Instruction 1: Choose the correct answer from the given alternatives

1. Which one of the following is used to implementing safety measures
 - A) Proper Ventilation
 - B) Emergency Preparedness
 - C) Proper Lifting Techniques
 - D) ALL
2. One of the following is maintenance requirements
 - A) Cleaning and Flushing
 - B) Regular inspection
 - C) Potable Water Testing
 - D) All
3. Which one is a class of specifications?
 - A) Design and Construction
 - B) Testing and certification
 - C) Material
 - D) All

Instruction 2: Write True if the statement is correct and false if the statement is incorrect

1. Quality assurance requirements refer to the set of criteria, processes, and activities.
2. Backflow prevention devices are not essential component of many plumbing systems
3. Occupational health and safety (OHS) plays a crucial role in commissioning and maintaining backflow prevention devices.

Instruction 3: Short answer

1. List types of insurance claims
2. What are the sequencing tasks in commissioning and maintain backflow prevention device
3. What are key considerations of selecting backflow prevention device

Unit Two: Identify testing and commissioning requirements

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identifying and confirming design information.
- Identifying backflow prevention materials

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify and confirm design information.
- Identify backflow prevention materials

2.1. Identifying and confirming design information.

Confirming design information is a crucial step in the design process, as it ensures that the design meets the desired requirements and specifications. This process involves gathering relevant information, verifying its accuracy, and confirming its applicability to the design project at hand. There are several methods and sources that can be utilized to identify and confirm design information.

One of the primary methods of identifying design information is through research. This involves conducting a thorough literature review to gather existing knowledge and best practices related to the specific design domain. Research can be conducted through various means, including online databases, academic journals, books, conference proceedings, and industry publications. These sources provide valuable insights into established design principles, methodologies, and case studies that can inform the design process.

In addition to research, consulting with experts in the field is another effective way to identify and confirm design information. Experts possess extensive knowledge and experience in their respective domains and can provide valuable insights and guidance throughout the design process. They can offer advice on best practices, potential challenges, and innovative solutions based on their expertise. Engaging in discussions or interviews with experts can help validate design decisions and ensure that the chosen approach aligns with industry standards.

Another important source of design information is documentation from previous projects or similar designs. Reviewing past designs can provide valuable insights into successful approaches, lessons learned, and potential pitfalls to avoid. This documentation may include technical specifications, design reports, user feedback, or post-implementation evaluations. Analysing this information can help designers make informed decisions and avoid reinventing the wheel.

Furthermore, prototyping and testing play a crucial role in identifying and confirming design information. By creating prototypes or mock-ups of the proposed design, designers can evaluate its functionality, usability, and performance. Testing these prototypes with end-users or stakeholders allows for valuable feedback that can validate or challenge initial assumptions. This iterative process helps refine the design based on real-world observations and user needs.

To confirm the accuracy and reliability of design information, it is essential to cross-reference multiple sources. This helps ensure that the information is consistent and supported by a consensus within the design community. Additionally, verifying the credibility and reputation of the sources is crucial. Trusted and authoritative publications, organizations, or experts are more likely to provide accurate and reliable design information.

Testing and commissioning requirements

There are several types of testing that can be performed depending on the nature of the system or component being tested. Some common types include:

1. **Unit Testing:** This type of testing focuses on verifying the functionality of individual units or components of a system. It is usually performed by developers and aims to identify any bugs or issues within a specific unit.
2. **Integration Testing:** Integration testing is conducted to test the interaction between different components or subsystems within a larger system. Its purpose is to ensure that these components work together seamlessly and produce the desired results.
3. **System Testing:** System testing involves testing the entire system as a whole to verify its compliance with functional and non-functional requirements. It tests the system's behavior in different scenarios and evaluates its performance, reliability, security, and usability.

Acceptance Testing: Acceptance testing is performed to determine whether a system meets the acceptance criteria defined by stakeholders or end-users. It aims to validate that the system satisfies their needs and requirements.

5. **Regression Testing:** Regression testing is conducted after making changes or enhancements to an existing system to ensure that these modifications have not introduced any new defects or issues.

On the other hand, commissioning refers to the process of ensuring that a newly constructed or modified system, facility, or equipment is fully functional and ready for operation. It involves a series of activities that include installation, inspection, testing, and verification to ensure that all components and systems are working correctly and safely.

The commissioning process typically includes the following steps:

1. **Installation:** This step involves physically installing the equipment or system according to the manufacturer's specifications and industry standards.

2. **Inspection:** After installation, a thorough inspection is conducted to verify that all components are correctly installed and meet the required standards.
3. **Functional Testing:** Functional testing is performed to ensure that each component or system operates as intended. This includes testing individual components, subsystems, and the overall system.
4. **Performance Testing:** Performance testing evaluates the system's performance under different conditions to ensure that it meets the specified requirements. This may involve stress testing, load testing, or endurance testing.
5. **Verification:** Verification ensures that all requirements, specifications, and regulations have been met during the construction or modification process.
6. **Documentation:** Throughout the commissioning process, detailed documentation is created to record all activities, tests performed, and results obtained. This documentation serves as a reference for future maintenance and troubleshooting.

Service and System Design in Building Work:

Service and system design are crucial aspects of building work that involve the planning, creation, and implementation of various systems and services that support the building's operations and maintenance. These systems and services include HVAC, plumbing, electrical, fire protection, and security, among others. In this guide, we will explore the key aspects of service and system design in building work, including the benefits, considerations, and best practices.

2.1.1 Benefits of Service and System Design in Building Work

Service and system design in building work offer numerous benefits, including:

1. **Improved Building Performance:** Well-designed systems and services can improve the building's performance, comfort, and safety. For example, an efficient HVAC system can provide consistent temperature and humidity levels, while a reliable plumbing system can ensure clean water and proper waste disposal.
2. **Reduced Maintenance Costs:** Properly designed systems and services can reduce maintenance costs over the building's lifespan. For instance, a well-maintained HVAC system can extend its lifespan and reduce the need for costly repairs or replacements.
3. **Enhanced Energy Efficiency:** Energy-efficient systems and services can help reduce energy consumption and lower utility bills. For example, a building with a high-performance HVAC system can reduce its energy consumption by up to 30%.

4. Improved Indoor Air Quality: Properly designed ventilation systems can improve indoor air quality, which can lead to improved occupant health and productivity.

5. Increased Property Value: A well-designed building with efficient systems and services can increase the property value and attract potential buyers or tenants.

2.1.2. Considerations for Service and System Design in Building Work

When designing systems and services for building work, there are several considerations that must be taken into account, including:

1. Building Type and Use: The type and use of the building should be a primary consideration when designing systems and services. For example, a hospital would require different systems and services than an office building.

2. Climate and Location: The building's location and climate should also be considered when designing systems and services. For example, a building in a hot and humid climate would require different systems and services than a building in a cold and dry climate.

3. Occupant Needs and Preferences: The needs and preferences of the building's occupants should also be considered when designing systems and services. For example, a building with a high percentage of elderly or disabled occupants may require additional accessibility features.

4. Budget and Maintenance Costs: The building's budget and maintenance costs should also be considered when designing systems and services. For example, a building with a limited budget may require more cost-effective systems and services.

2.1.3. Best Practices for Service and System Design in Building Work

Here are some best practices for service and system design in building work:

1. Collaborate with Stakeholders: Collaborate with stakeholders, including architects, engineers, contractors, and building owners, to ensure that the systems and services meet the building's needs and requirements.

2. Use Energy-Efficient Systems and Technologies: Use energy-efficient systems and technologies to reduce energy consumption and lower utility bills.

3. Incorporate Renewable Energy Sources: Incorporate renewable energy sources, such as solar or wind power, to reduce the building's reliance on non-renewable energy sources.

4. **Use Life Cycle Costing:** Use life cycle costing to evaluate the total cost of ownership of the systems and services over the building's lifespan.

5. **Consider Building Information Modelling (BIM):** Consider using Building Information Modelling (BIM) to improve the design, construction, and operation of the building.

2.1.4. The main objectives of testing and commissioning in construction work

1. **Quality Assurance:** Testing and commissioning activities ensure that all systems and components meet the required quality standards. By identifying and rectifying any issues or defects early on, the overall quality of the building is improved.

2. **System Integration:** Building systems are often interconnected and rely on each other for proper functioning. Through testing and commissioning, the integration of these systems is verified to ensure seamless operation.

3. **Occupant Safety and Comfort:** Testing and commissioning activities play a crucial role in ensuring the safety and comfort of building occupants. By testing safety systems, such as fire alarms and emergency lighting, potential risks can be identified and mitigated. Additionally, performance tests help ensure that HVAC systems provide a comfortable indoor environment.

In conclusion, testing and commissioning requirements in building work are essential to guarantee the proper functioning, safety, and efficiency of all systems within a building. Through various tests and inspections, any defects or issues can be identified and rectified, ensuring that the building meets the required standards.

2.1.5. Job specifications and standards and relevant information in building work

In building work, job specifications and standards play a crucial role in ensuring that construction projects are carried out efficiently, safely, and according to industry best practices. These specifications and standards provide detailed information about the requirements, materials, methods, and quality expectations for various aspects of the construction process. They help establish a common understanding between project owners, architects, engineers, contractors, and other stakeholders involved in the construction project.

Job Specifications in Building Work:

Job specifications outline the specific requirements for a particular job or task within the construction project.

These specifications typically include details such as:

1. **Scope of Work:** The scope of work defines the boundaries and extent of the job. It outlines what needs to be done, what is included, and what is excluded from the job.
2. **Materials and Equipment:** Job specifications specify the type, quality, and quantity of materials and equipment required for the job. This includes specifying the grade of materials, dimensions, finishes, and any specific brand or manufacturer requirements.
3. **Methods and Techniques:** Specifications provide instructions on how to perform the job or task. This includes detailing the sequence of activities, construction techniques, installation methods, and any specific procedures that need to be followed.
4. **Quality Standards:** Job specifications define the expected quality standards for the work being performed. This includes specifying acceptable tolerances, surface finishes, strength requirements, and any testing or inspection procedures that need to be followed.
5. **Health and Safety Requirements:** Specifications also include health and safety requirements that need to be adhered to during the construction process. This includes guidelines on personal protective equipment (PPE), hazard identification and mitigation measures, emergency procedures, and compliance with relevant regulations.
6. **Environmental Considerations:** Job specifications may also include environmental considerations such as waste management practices, energy efficiency requirements, sustainable material choices, and adherence to environmental regulations.

Standards in Building Work:

Standards in building work are established by industry organizations, regulatory bodies, and government agencies to ensure uniformity, safety, and quality in construction projects. These standards provide guidelines and requirements for various aspects of building work, including:

1. **Building Codes:** Building codes are regulations that set minimum standards for the design, construction, and occupancy of buildings. They cover areas such as structural integrity, fire safety, electrical systems, plumbing, accessibility, and energy efficiency. Building codes vary by jurisdiction but are typically based on national or international standards.
2. **Material Standards:** Material standards specify the properties, performance criteria, and testing methods for construction materials. These standards ensure that materials used in building work meet specific quality and safety requirements. Examples include standards for concrete, steel, timber, insulation materials, and electrical wiring.

3. **Construction Process Standards:** Construction process standards provide guidelines for various construction activities such as excavation, foundation construction, framing, roofing, plumbing installation, electrical wiring, and finishing work. These standards help ensure that construction work is carried out safely and efficiently.

4. **Occupational Health and Safety Standards:** Occupational health and safety standards focus on ensuring a safe working environment for construction workers. They cover areas such as hazard identification and control, personal protective equipment (PPE), scaffolding requirements, fall protection measures, electrical safety, and machinery operation.

5. **Quality Management Standards:** Quality management standards provide frameworks for implementing quality control and assurance processes in construction projects. These standards help ensure that construction work meets specified quality requirements and that appropriate quality control measures are in place throughout the project lifecycle.

6. **Environmental Standards:** Environmental standards address the environmental impact of construction activities. They cover areas such as waste management practices, pollution prevention measures, sustainable design principles, energy efficiency requirements, and compliance with environmental regulations.

Relevant Information in Building Work:

In addition to job specifications and standards, there is a wealth of relevant information available in building work that helps guide construction projects. This information includes:

1. **Architectural and Engineering Drawings:** Architectural and engineering drawings provide detailed plans, elevations, sections, and specifications for the construction project. These drawings communicate the design intent and provide critical information for contractors to execute the work accurately.

2. **Building Information Modelling (BIM):** BIM is a digital representation of the physical and functional characteristics of a building. It includes 3D models, data-rich objects, and information about materials, systems, and components. BIM facilitates collaboration, coordination, and visualization of the construction project.

3. **Manufacturer Specifications:** Manufacturer specifications provide detailed information about specific products or materials used in construction. These specifications include technical data, installation instructions, performance characteristics, and maintenance requirements for the products.

4. **Regulatory Requirements:** Regulatory requirements include permits, licenses, and approvals needed for construction projects. These requirements vary by jurisdiction and may include zoning regulations, environmental impact assessments, building permits, fire safety certificates, and occupancy permits.

5. **Industry Best Practices:** Industry best practices are guidelines and recommendations developed by industry associations and experienced professionals. They reflect proven methods, techniques, and approaches that have been successful in similar construction projects.

6. **Research Publications:** Research publications from academic institutions, research organizations, and industry bodies provide valuable insights into new technologies, innovative construction methods, sustainable practices, and emerging trends in the building industry.

2.2 Identifying backflow prevention materials

Backflow prevention is a crucial aspect of construction work, particularly in plumbing systems. It involves the installation of devices or materials that prevent the reverse flow of water or other substances into the main water supply. Identifying the appropriate backflow prevention materials is essential to ensure the safety and integrity of the plumbing system.

There are several types of backflow prevention materials commonly used in construction work. These materials are designed to meet specific requirements and regulations set by local authorities.

The following are some of the most commonly used backflow prevention materials:

1. **Backflow Preventer Valves:** Backflow preventer valves are mechanical devices installed in plumbing systems to prevent the reverse flow of water. These valves allow water to flow in one direction but close automatically when there is a change in pressure, preventing backflow. There are different types of backflow preventer valves, including pressure vacuum breakers (PVB), reduced pressure zone (RPZ) valves, and double check valves (DCV). Each type has its own specific application and level of protection.

2. **Air Gaps:** An air gap is a physical separation between the water supply outlet and any potentially contaminated source. It creates a vertical space through which water flows, preventing any backflow from occurring. Air gaps are often used in situations where there is a high risk of contamination, such as in industrial settings or for irrigation systems.

3. **Check Valves:** Check valves, also known as non-return valves, are simple mechanical devices that allow water to flow in one direction only. They consist of a valve disc or flap that opens when water flows in the desired direction and closes when there is a reverse flow. Check valves are commonly used in various plumbing applications, including preventing backflow in sump pumps, sewage ejector systems, and other similar installations.

4. **Break Tanks:** Break tanks are reservoirs that provide a physical separation between the main water supply and the plumbing system. They are often used in situations where there is a risk of contamination or when the water pressure is insufficient. Break tanks can be equipped with backflow prevention devices to ensure the integrity of the water supply.

5. **Reduced Pressure Zone (RPZ) Assemblies:** RPZ assemblies are specialized backflow preventer valves that provide a high level of protection against backflow. They consist of multiple check valves and a relief valve, creating a zone of reduced pressure between the water supply and the plumbing system. RPZ assemblies are typically used in commercial and industrial applications where there is a higher risk of contamination.

In conclusion, identifying the appropriate backflow prevention materials in construction work is crucial for maintaining the safety and integrity of plumbing systems. Backflow preventer valves, air gaps, check valves, break tanks, and RPZ assemblies are some of the commonly used materials in preventing backflow.

Backflow prevention devices are crucial components in plumbing systems that help to protect the potable water supply from contamination. These devices are designed to prevent the reverse flow of water, which can occur due to backpressure or back siphon age. To identify the specifications of a backflow prevention device, several factors need to be considered, including the type of device, its size, pressure rating, and certification requirements.

2.2.1. Types of backflow prevention devices:

There are several types of backflow prevention devices available, each with its own specifications and applications. The most common types include:

1. **Atmospheric Vacuum Breaker (AVB):** AVBs are simple devices that allow air to enter the plumbing system when there is a drop in pressure, preventing back siphon age. They are typically used in low-hazard applications and have specific installation requirements.

2. **Pressure Vacuum Breaker (PVB):** PVBs are more complex devices that use a spring-loaded check valve and an air inlet valve to prevent both backpressure and back siphon age. They are suitable for medium-hazard applications and require regular testing and maintenance.

3. **Double Check Valve Assembly (DCVA):** DCVAs consist of two independently operating check valves that provide protection against both backpressure and back siphon age. They are commonly used in high-hazard applications and require annual testing and maintenance.

4. **Reduced Pressure Zone Assembly (RPZ):** RPZs offer the highest level of protection against backflow by incorporating two check valves and a relief valve. They are used in high-hazard applications where contamination poses a significant risk. RPZs require annual testing and maintenance.

2.2.1. Specifications to Consider:

When identifying the specifications of a backflow prevention device, the following factors should be taken into account:

1. **Type and Model:** Determine the specific type and model of the backflow prevention device required for the application. This will depend on the level of hazard associated with the water supply and the local plumbing codes.

2. **Size:** Backflow prevention devices come in various sizes to accommodate different flow rates. The size of the device should be selected based on the anticipated water demand and pipe diameter.

3. **Pressure Rating:** Consider the pressure rating of the backflow prevention device to ensure it can handle the maximum pressure expected in the plumbing system. The pressure rating should be compatible with the system's operating pressure.

4. **Certification:** Verify that the backflow prevention device meets the necessary certification standards, such as those set by the American Society of Sanitary Engineering (ASSE) or the International Association of Plumbing and Mechanical Officials (IAPMO). Certification ensures that the device has been tested and approved for its intended use.

5. **Installation Requirements:** Each type of backflow prevention device has specific installation requirements outlined by plumbing codes and manufacturers. These requirements may include minimum distances from potential contaminants, proper orientation, and accessibility for testing and maintenance.

6. Testing and Maintenance: Consider the testing and maintenance requirements of the backflow prevention device. Regular testing, typically performed by a certified professional, is necessary to ensure proper functioning and compliance with regulations.

Part I

Self-check 2

Chose the correct answer

- Conducted to test the interaction between different components or subsystems within a larger system.
A. Unit test B. Integration test C. Regression Testing D. System test
- Service and system design in building work offer numerous benefits is ?
A. Improved Building Performance B. Reduced Maintenance Costs
C. Improved Indoor Air Quality D. All
- Job Specifications in Building Work is
A. Materials and Equipment B. Scope of work C. Methods and Techniques D. All
- Types of Backflow Prevention Devices is
A. Atmospheric Vacuum Breaker B. Pressure Vacuum Breaker
C. Double Check Valve Assembly D. All
- The standards provide guidelines and requirements for various aspects of building work is
A. Material Standards B. Building code C. Construction standard process D. All

Part II

Give short answer

- List the types of commissioning process
- Identify testing and commissioning requirements
- _____ typically starts during the construction phase but continues after completion when the building is occupied.
- Identifying the specifications of a backflow prevention device.
- _____ are mechanical devices installed in plumbing systems to prevent the reverse flow of water.

Unit3: Test and commission device.

This unit is developed to provide you the necessary information regarding the following content coverage and topics:

- Installing and checking ensure device
- Requiring and testing operation of device.
- Completing documentation.

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Install and check ensure device
- Require and test operation of device.
- Complete documentation.

3.1. Install and check ensure device

Installing and maintaining backflow prevention devices is a crucial process in safeguarding the integrity of potable water distribution systems. These devices are specifically designed to prevent the backward flow of water, which can potentially contaminate the water supply.

In this comprehensive explanation, we will delve into the various steps involved in installing, checking, commissioning, and maintaining backflow prevention devices.

Installation of Backflow Prevention Devices: The installation process of backflow prevention devices typically involves the following steps:

A. Identify the appropriate location: The first step is to determine the optimal location for installing the backflow prevention device. This is usually done near the point of connection between the potable water system and any potential sources of contamination, such as irrigation systems or industrial processes.

When selecting a location for a BPD, it is important to consider the following factors:

1. **Accessibility:** The BPD should be located in a location where it is easily accessible for testing and maintenance.
2. **Protection from the elements:** The BPD should be protected from the elements, such as rain, snow, and direct sunlight.
3. **Adequate space:** The BPD should be located in a location where there is adequate space to install and maintain the device.
4. **Prevention of backflow:** The BPD should be located in a location where it will effectively prevent backflow from occurring.

Here are some specific examples of good locations for installing BPDs:

1. **Irrigation systems:** BPDs should be installed on the main water line leading to the irrigation system, upstream of any valves or other devices.
2. **Industrial processes:** BPDs should be installed on the main water line leading to the industrial process, upstream of any valves or other devices.

3. **Other non-potable water systems:** BPDs should be installed on the main water line leading to any non-potable water system, such as a fire sprinkler system or a cooling tower.

B. **Select the appropriate type of device:** There are different types of backflow prevention devices available, including air gaps, reduced pressure zone (RPZ) valves, double check valves, and vacuum breakers. The selection of the device depends on factors such as the level of hazard and local regulations.

There are many different types of backflow prevention devices (BPDs) available, each with its own specific advantages and disadvantages. The type of BPD that is selected will depend on a number of factors, including:

1. **The level of hazard being protected against:** The level of hazard is determined by the type of non-potable water or substance that is being protected against. For example, a higher level of hazard protection is required for systems that contain hazardous chemicals or wastewater.
2. **Local regulations:** Some local regulations may specify the type of BPD that must be used for certain applications.

Here is a brief overview of the most common types of BPDs:

1. **Air gaps:** An air gap is a physical separation between the potable water system and the non-potable water system. Air gaps are the most effective type of BPD, but they are not always practical to install.

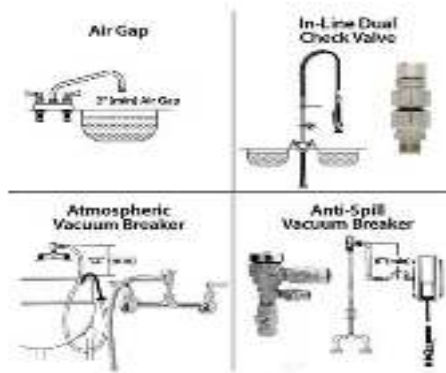


Figure 3-1 Air gaps

2. **Reduced pressure zone (RPZ) valves:** RPZ valves are the most common type of BPD used for high-hazard applications. They work by creating a reduced pressure zone between the potable water system and the non-potable water system.

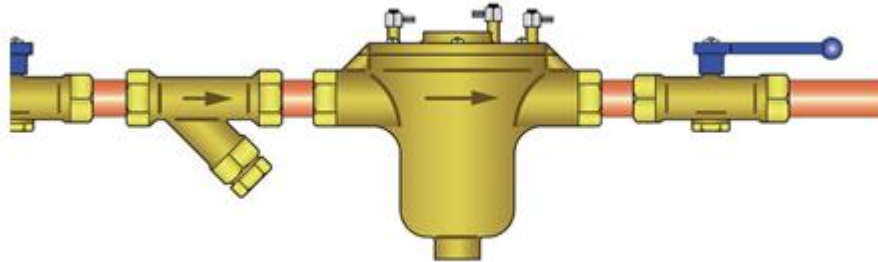


Figure 3-2 **Reduced pressure zone (RPZ) valves**

3. **Double check valves:** Double check valves are another common type of BPD. They work by using two check valves to prevent backflow.



Figure 3-3 **Double check valves**

4. **Vacuum breakers:** Vacuum breakers are used to prevent backflow caused by a vacuum in the water line. They are commonly used on irrigation systems and hose bibbs.



Figure 3.4 Vacuum breakers

C. **Prepare the installation site:** Before installing the device, it is essential to prepare the site by ensuring proper clearance and accessibility for maintenance purposes. This may involve clearing any obstructions and providing adequate space for future inspections.

To prepare the installation site for a device, several steps need to be taken to ensure proper clearance and accessibility for maintenance purposes. This involves clearing any obstructions and providing adequate space for future inspections. Here is a detailed explanation of the process:

1. **Clearing Obstructions:** The first step in preparing the installation site is to clear any obstructions that may hinder the device's operation or maintenance. This includes removing debris, vegetation, or any other objects that could interfere with the device's functionality. It is important to ensure that there is enough space around the device for easy access during installation and future maintenance activities.
2. **Providing Adequate Space:** The next step is to provide sufficient space for the device and its associated components. This includes considering the dimensions of the device, as well as any additional equipment or infrastructure required for its operation. It is crucial to follow the manufacturer's guidelines and specifications regarding the required clearance around the device. This will allow for proper airflow, ventilation, and heat dissipation, which are essential for optimal performance and longevity of the device.

3. **Accessibility for Maintenance:** Another important aspect of preparing the installation site is ensuring easy accessibility for maintenance purposes. This involves considering factors such as the location of service panels, control panels, and other components that may require regular inspection or servicing. It is essential to provide enough space around these areas to allow technicians to perform their tasks efficiently and safely.

D. **Install the device:** Following manufacturer guidelines and local regulations, install the selected backflow prevention device at the designated location. This typically involves connecting it to the existing plumbing system using appropriate fittings and ensuring a secure and leak-free installation.

It is important to follow the manufacturer's guidelines and local regulations when installing a backflow prevention device (BPD). This will help to ensure that the BPD is installed correctly and will operate properly.

Here is a general overview of the steps involved in installing a BPD:

- A. Shut off the water supply to the area where the BPD will be installed.
- B. Drain the water from the pipes.
- C. Cut the pipe at the desired location for the BPD.
- D. Install the BPD according to the manufacturer's instructions.
- E. Connect the BPD to the existing plumbing system using appropriate fittings.
- F. Turn on the water supply and check for leaks.
- G. Test the BPD to ensure that it is operating properly.

It is important to note that the specific steps involved in installing a BPD will vary depending on the type of BPD and the existing plumbing system. Be sure to follow the manufacturer's instructions carefully.

E. **Test for proper installation:** Once installed, it is crucial to test the device to ensure its proper functioning. This may involve conducting a series of tests, such as a visual inspection, pressure testing, and flow testing.

It is important to test a backflow prevention device (BPD) after it is installed to ensure that it is operating properly. The specific tests that are performed will vary depending on the type of BPD, but they typically include:

1. **Visual inspection:** The BPD should be inspected for any signs of damage or defects.
2. **Pressure testing:** The BPD should be pressure tested to ensure that it is operating properly. This is usually done by attaching a pressure gauge to the BPD and applying a certain amount of pressure. The pressure gauge should read the same pressure before and after the BPD.
3. **Flow testing:** The BPD should be flow tested to ensure that it is not allowing any backflow. This is usually done by connecting a flow meter to the BPD and opening a valve downstream of the BPD. The flow meter should read zero if the BPD is operating properly.

If the BPD fails any of the tests, it should be repaired or replaced immediately.

Here are some additional tips for testing a BPD:

- Follow the manufacturer's instructions carefully.
- Use the correct test equipment.
- Perform the tests in a safe and controlled manner.
- Keep a record of the test results.

Checking and Commissioning Backflow Prevention Devices: After installation, it is necessary to check and commission backflow prevention devices to ensure their effectiveness in preventing backflow incidents. The following steps are typically involved in this process:

- A. **Visual inspection:** Conduct a visual inspection of the installed device to ensure it is correctly positioned, securely mounted, and free from any physical damage or signs of wear.
- B. **Functional testing:** Perform functional tests to verify that the backflow prevention device operates as intended. This may include simulating various flow conditions and monitoring the device's response to ensure it effectively prevents backflow.

- C. **Pressure testing:** Conduct pressure tests to assess the device's ability to withstand different pressure conditions. This involves subjecting the device to higher pressures than it would typically encounter in normal operation and ensuring it maintains its integrity.
- D. **Documentation and certification:** Maintain detailed records of the installation, testing, and commissioning process. This documentation serves as proof of compliance with regulations and provides a reference for future maintenance and inspections.

Maintenance of Backflow Prevention Devices: Regular maintenance is crucial for ensuring the ongoing effectiveness of backflow prevention devices. The following maintenance practices are typically recommended:

- A. **Routine inspections:** Regularly inspect backflow prevention devices for any signs of damage, wear, or malfunction. This includes checking for leaks, corrosion, loose fittings, or any other issues that may compromise the device's performance.
- B. **Cleaning and flushing:** Periodically clean and flush the backflow prevention device to remove any accumulated debris or sediment that could hinder its operation. This helps maintain optimal flow conditions and prevents clogging or blockages.
- C. **Testing and certification:** Schedule periodic testing of backflow prevention devices to verify their continued functionality. This may involve engaging certified professionals who can conduct comprehensive tests and issue certifications upon successful evaluation.
- D. **Compliance with regulations:** Stay updated with local regulations regarding backflow prevention devices and ensures compliance with any required inspections, certifications, or reporting obligations.

In conclusion, installing and maintaining backflow prevention devices is a critical aspect of protecting potable water distribution systems from contamination risks. By following proper installation procedures, conducting thorough checks and commissioning, and implementing regular maintenance practices, the integrity of the water supply can be effectively safeguarded.

3.2. Requiring and testing operation of device.

When it comes to requiring and testing the operation of a device, there are several important considerations to keep in mind. This process is crucial in ensuring that the device functions properly and meets the desired specifications. In this comprehensive response, we will explore the various aspects of requiring and testing the operation of a device, including the steps involved the importance of testing, and some common testing methods.

Requiring a Device:

Before testing the operation of a device, it is essential to clearly define the requirements for its functionality. This involves understanding the purpose of the device, its intended use, and any specific features or capabilities it should possess. Requiring a device typically involves gathering input from stakeholders such as end-users, designers, engineers, and other relevant parties.

The requirements for a device can vary depending on its nature. For example, if it is a software application, the requirements may include specific functionalities, performance benchmarks, compatibility with different operating systems or devices, and user interface design. On the other hand, if it is a physical device like a smartphone or a medical instrument, the requirements may involve factors such as size, weight, durability, power consumption, and safety standards.

Testing Operation:

Once the requirements for a device have been established, it is crucial to thoroughly test its operation to ensure that it meets these requirements. Testing helps identify any defects or issues that may arise during normal usage and allows for necessary adjustments or improvements to be made before releasing the device to end-users.

The testing process typically involves several stages:

- 1. Unit Testing:** This initial stage focuses on testing individual components or modules of the device to ensure they function correctly in isolation. It helps identify any bugs or errors within specific sections of the device's code or hardware.
- 2. Integration Testing:** In this stage, different components or modules are combined and tested together to ensure they work seamlessly as a whole. Integration testing helps identify any compatibility issues or communication problems between different parts of the device.
- 3. System Testing:** This stage involves testing the entire system or device as a whole to ensure that it meets the specified requirements. It includes testing various functionalities, performance

benchmarks, and user interactions. System testing helps identify any issues that may arise when different components interact with each other.

4. Acceptance Testing: This final stage involves testing the device in a real-world environment to ensure that it meets the expectations of end-users. Acceptance testing is typically performed by end-users or a designated group of individuals who represent the target audience. It helps validate whether the device meets the desired specifications and performs as intended.

Importance of Testing:

Testing the operation of a device is crucial for several reasons:

- 1. Quality Assurance:** Testing helps ensure that the device functions correctly and meets the specified requirements. It helps identify any defects or issues that may affect its performance, reliability, or user experience.
- 2. Risk Mitigation:** By thoroughly testing a device, potential risks can be identified and addressed before it is released to end-users. This reduces the chances of malfunctions, safety hazards, or other issues that could lead to negative consequences.
- 3. Customer Satisfaction:** Properly tested devices are more likely to meet customer expectations and provide a positive user experience. By identifying and resolving any issues during the testing phase, companies can deliver high-quality products that satisfy their customers' needs.

Common Testing Methods:

There are various testing methods used to test the operation of a device, depending on its nature and requirements. Some common testing methods include:

- 1. Functional Testing:** This type of testing focuses on verifying that each function or feature of the device performs as intended. It ensures that all functionalities work correctly and produce the expected outputs.
- 2. Performance Testing:** Performance testing evaluates how well a device performs under specific conditions, such as high loads or heavy usage. It helps identify any performance bottlenecks, scalability issues, or resource limitations.
- 3. Usability Testing:** Usability testing assesses the device's user interface and overall user experience. It involves observing users as they interact with the device to identify any usability issues, difficulties, or areas for improvement.

4. Security Testing: Security testing aims to identify vulnerabilities or weaknesses in the device's security measures. It helps ensure that sensitive data is protected and that the device is resistant to potential attacks or breaches.

In conclusion, requiring and testing the operation of a device is a crucial process in ensuring its functionality, reliability, and user satisfaction. By clearly defining the requirements and thoroughly testing the device's operation using various methods, companies can deliver high-quality products that meet customer expectations. Proper testing helps identify and address any defects or issues before the device is released to end-users, reducing risks and ensuring a positive user experience.

3.3. Completing documentation

Completing documentation is an essential part of any project or task. Documentation serves as a record of the work done, providing information about the process, decisions made, and outcomes achieved. It helps in maintaining consistency, facilitating collaboration, and ensuring that knowledge is preserved for future reference.

When it comes to completing documentation, there are several key steps to consider. These steps may vary depending on the nature of the project or task, but generally include the following:

1. Define the purpose: Before starting the documentation process, it is important to clearly define the purpose of the document. This involves understanding who the audience is and what they need to know. For example, if you are documenting a software development project, the purpose could be to provide instructions for installation and usage.

2. Gather information: The next step is to gather all the necessary information that needs to be included in the documentation. This may involve reviewing project plans, meeting notes, design documents, or any other relevant sources of information. It is important to ensure that all information is accurate and up-to-date.

3. Organize the content: Once you have gathered all the necessary information, it is important to organize it in a logical and coherent manner. This can be done by creating an outline or structure for the document. The content should be divided into sections or chapters, with headings and subheadings to make it easy to navigate.

4. Write clear and concise content: When writing the actual content of the document, it is important to use clear and concise language. Avoid using jargon or technical terms that may not

be familiar to the intended audience. Use bullet points or numbered lists to break down complex information into smaller, more manageable chunks.

5. Include visuals: Visuals such as diagrams, screenshots, or illustrations can greatly enhance the clarity and understanding of the documentation. Use visuals strategically to illustrate concepts or demonstrate step-by-step processes. Make sure that all visuals are labeled and referenced appropriately.

6. Review and revise: Once the initial draft of the documentation is complete, it is important to review and revise it for accuracy, clarity, and completeness. This may involve seeking feedback from colleagues or subject matter experts to ensure that all relevant information has been included.

7. Format and style: The final step in completing documentation is to format and style the document to make it visually appealing and easy to read. In conclusion, completing documentation is a crucial step in any project or task. By following a systematic approach and considering the needs of the audience, you can create comprehensive and effective documentation that serves its purpose.

Self-check 3

Instruction 1: Choose the best answer from the given alternatives

1. Which of the following is NOT a step in testing and commissioning a device?
 - A. Installing and checking the device
 - B. Requiring and testing the operation of the device
 - C. Completing documentation
 - D. Writing code for the device
2. What is the purpose of testing and commissioning a device?
 - A. To ensure that the device is safe and meets its design requirements
 - B. To provide training on how to use the device
 - C. To create documentation for the device
 - D. To troubleshoot any problems with the device
3. What should be done if a problem is found during testing and commissioning?
 - A. Continue testing and commissioning the device
 - B. Fix the problem and then continue testing and commissioning the device
 - C. Ignore the problem and continue testing and commissioning the device
 - D. Report the problem to the manufacturer or supplier of the device
4. What should be included in the documentation for a device?
 - A. Instructions on how to use the device
 - B. Maintenance and troubleshooting procedures
 - C. Technical specifications for the device
 - D. All of the above
5. Which of the following is NOT a type of test that may be performed during testing and commissioning?

- A. Functional test
- B. Performance test
- C. Safety test
- D. User acceptance test

Instruction2: Write **True** if the statement is correct and write **False** if the statement is incorrect.

1. Testing and commissioning should be performed by qualified personnel.
2. All devices should be tested and commissioned before they are put into service.
3. Testing and commissioning can be a complex process, depending on the device.
4. It is important to document the results of all testing and commissioning activities.
5. Testing and commissioning is not necessary for all devices.

Instruction3: Write short answer for the following questions

1. What are the benefits of testing and commissioning a device?
2. What are some of the challenges that can be faced during testing and commissioning a device?
3. What are some of the best practices for testing and commissioning a device?
4. What are some of the most common types of tests that are performed during testing and commissioning a device?

Unit Four : Maintaining device and restore work

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identifying service and maintenance.
- Checking and fitting replacement components.
- Clearing, disposing and recycling materials
- Cleaning and maintaining equipment.
- Completing requirement documentation.

This guide will also assist you to attain the learning outcomes stated in the cover page.

Specifically, upon completion of this learning guide, you will be able to:

- Identify service and maintenance.
- Check and fit replacement components.
- Clear, dispose and recycle materials
- Clean and maintain equipment's.
- Complete requirement documentation.

4.1. Identifying service and maintenance

Backflow prevention devices are crucial components in plumbing systems that help to prevent the contamination of potable water. These devices are designed to ensure that water flows in one direction, preventing the backflow of non-potable water or other substances into the clean water supply. To maintain the effectiveness of backflow prevention devices, regular service and maintenance are essential.

Service and maintenance of backflow prevention devices involve several key steps:

- 1. Inspection:** Regular inspections are necessary to identify any potential issues with the backflow prevention device. This includes checking for signs of wear and tear, damage, or corrosion. Inspections should be conducted by a certified professional who is trained in backflow prevention device maintenance.
- 2. Testing:** Backflow prevention devices need to be tested periodically to ensure their proper functioning. This involves simulating different scenarios that could lead to backflow and measuring the device's performance. Testing typically includes checking for proper pressure differential, valve operation, and sealing capabilities.
- 3. Cleaning:** Backflow prevention devices can accumulate debris, sediment, or mineral deposits over time, which can affect their performance. Regular cleaning is necessary to remove any obstructions and ensure smooth water flow through the device. Cleaning methods may vary depending on the type of backflow prevention device and its specific requirements.
- 4. Repair or Replacement:** If any issues or malfunctions are detected during inspection or testing, appropriate repairs or replacements should be carried out promptly. This may involve replacing damaged parts, adjusting valves, or even replacing the entire backflow prevention device if necessary.
- 5. Record-Keeping:** It is important to maintain detailed records of all service and maintenance activities performed on backflow prevention devices. This includes documenting inspection dates, test results, repairs made, and any other relevant information. These records help track the history of each device and ensure compliance with local regulations.

Regular service and maintenance of backflow prevention devices offer several benefits:

1. **Preventing Contamination:** By ensuring the proper functioning of backflow prevention devices, the risk of contamination in the potable water supply is significantly reduced. This helps protect public health and safety.
2. **Compliance with Regulations:** Many jurisdictions have specific regulations and requirements for backflow prevention device maintenance. Regular service and maintenance help ensure compliance with these regulations and avoid potential penalties or legal issues.
3. **Extending Lifespan:** Proper maintenance can extend the lifespan of backflow prevention devices, reducing the need for frequent replacements. This can result in cost savings over time.

4.2. Checking and fitting replacement components

Checking replacement components for backflow prevention devices, there are several key steps to follow:

1. **Identifying the Device:** The first step is to identify the specific backflow prevention device that requires replacement components. There are different types of devices, such as reduced pressure zone (RPZ) valves, double check valves (DCV), and pressure vacuum breakers (PVB). Each device has its own unique set of components that need to be checked and replaced if necessary.
2. **Inspecting the Device:** Before proceeding with any component replacements, it is important to thoroughly inspect the backflow prevention device. This involves visually examining the device for any signs of damage, corrosion, or wear. Additionally, it is essential to check for any leaks or abnormal pressure readings.
3. **Consulting Manufacturer Guidelines:** To ensure proper replacement of components, it is crucial to consult the manufacturer's guidelines or instructions for the specific backflow prevention device. These guidelines provide detailed information on the correct procedure for checking and fitting replacement components.
4. **Removing Old Components:** If any components are found to be faulty or worn out during the inspection, they need to be removed before fitting replacements. This typically involves shutting off the water supply, relieving pressure from the system, and carefully disconnecting the old components from the device.

5. **Cleaning and Preparing New Components:** Before fitting new replacement components, it is important to clean them thoroughly and ensure they are free from any debris or contaminants. This can be done using appropriate cleaning agents and following the manufacturer's recommendations.
6. **Fitting Replacement Components:** Once the old components have been removed and the new ones are cleaned and prepared, they can be fitted into the backflow prevention device. This process requires careful attention to detail, as each component needs to be properly aligned and securely fastened according to the manufacturer's instructions.
7. **Testing and Verification:** After fitting the replacement components, it is essential to test the backflow prevention device to ensure its proper functioning. This typically involves conducting a series of tests, such as a pressure test or a flow test, to verify that the device is preventing backflow effectively.

4.3. Clearing, disposing and recycling materials

There are three steps of clearing back flow prevention device the first is regular cleaning and maintenance of backflow prevention devices are essential to remove any debris or sediment that may have accumulated. This can be done by flushing the device with water, cleaning the screen or membrane with a soft brush, and inspecting the device for any signs of damage or wear.

And the second If the device has any damaged or worn-out parts, they should be replaced promptly to ensure proper function. For example, if the relief valve is damaged, it should be replaced with a new one to prevent any potential risks. Lastly if there are any obstructions in the device, such as mineral buildup or debris, they should be removed using appropriate tools and techniques.

Disposing the materials of backflow prevention devices

Disposing material refers to the act of getting rid of or discarding waste or unwanted substances in a proper and responsible manner. It involves the process of managing and handling various types of material. This includes the following method:

Proper disposal methods: Backflow prevention devices should be disposed of properly to prevent any environmental hazards or contamination of soil and groundwater. The materials should be separated and categorized based on their composition and hazard level.

Recyclable materials: Some components of backflow prevention devices, such as the relief valve and other metallic parts, can be recycled. These materials should be collected and sent to a recycling facility for proper processing.

Non-recyclable materials: Other components, such as the plastic or rubber parts, cannot be recycled and should be disposed of in a landfill.

Recycling the materials of backflow prevention devices:

Recycling is the process of collecting, sorting, processing, and reusing materials that would otherwise be discarded as waste. It involves transforming waste materials into new products or raw materials that can be used in the production of new goods. This includes:

1. **Metal recycling:** Metallic components, such as the relief valve, can be recycled and melted down to produce new metal products.
2. **Plastic recycling:** Plastic components, such as the body of the device, can be recycled and converted into new plastic products.
3. **Rubber recycling:** Rubber components, such as the gaskets and O-rings, can be recycled and used as rubber mulch or other rubber products.

4.4. Cleaning and maintaining equipment

Cleaning and maintaining equipment is an essential aspect of ensuring its longevity, optimal performance, and safety. Regular cleaning and maintenance help prevent the buildup of dirt, dust, debris, and other contaminants that can negatively impact the equipment's functionality. Additionally, proper maintenance can identify potential issues early on, allowing for timely repairs and minimizing downtime.

4.5. Completing requirement documentation

Completing requirement documentation refers to the process of creating a comprehensive and detailed document that outlines the specific needs, features, and functionalities of a software system or project. This documentation serves as a guide for developers, designers, testers, and other stakeholders involved in the development process.

It is essential to maintain detailed documentation of the backflow prevention device installation. This includes recording information such as the device type, manufacturer, model number, installation date, and any relevant test results or certifications.

Self-check -4

Directions: Answer all the questions listed below.

Part I: Fill in the blank space

- _____ are crucial components in plumbing systems that help to prevent the contamination of potable water
- _____ is regular cleaning and maintenance of backflow prevention devices are essential to remove any debris or sediment that may have accumulated.

Part-II: Choose the correct answer from the given alternatives

- _____ refers to the process of creating a comprehensive and detailed document that outlines the specific needs.

A. Documentation	B. Clearing
C. Disposing	D. All
- _____ is the process of collecting, sorting, processing, and reusing materials that would otherwise be discarded as waste

A. Cleaning	B. Documentation
C. Recycling	D. All

Part- III: write the answer briefly for the following question.

- Write and describe three types of recycling material?
- What is the importance of record keeping?

Reference

- International Plumbing Code (IPC) - Published by the International Code Council (ICC),
- British Standards Institution (BSI) –
- American Society of Plumbing Engineers (ASPE) –
- "Air Testing in Drainage Systems" by the International Association of Plumbing and Mechanical Officials (IAPMO)
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