**Building Science Education Solution Center – Preventative Maintenance**

Proficiency Level 1: Remember

**Learning Objective 1.1:**

* Define preventative maintenance and identify who is responsible for this type of maintenance.

**Lecture Notes 1.1:**

References:

ACCA Standard 4: Maintenance of Residential HVAC Systems (4/8/2019):

[Quality Maintenance of Residential HVAC Systems - ANSI/ACCA 4 QM - 2019](https://www.acca.org/communities/community-home/librarydocuments/viewdocument?DocumentKey=1437374d-083c-464f-8619-8df20f558bf6)

DOE Energy Saver: Maintaining Your Air Conditioner
[Maintaining Your Air Conditioner | Department of Energy](https://www.energy.gov/energysaver/maintaining-your-air-conditioner)

[Common Air Conditioner Problems | Department of Energy](https://www.energy.gov/energysaver/common-air-conditioner-problems)

Heating, Ventilation, and Air Conditioning (HVAC) systems require regular, preventative maintenance in order to operate effectively and efficiently. This includes the care of air conditioner filters, coils, and fins. When caring for an HVAC system, the homeowner can expect to monitor, adjust, clean, and replace components. Conducting these tasks on a regular basis will prolong the life of the HVAC system and allow it to perform optimally.

Tasks for the homeowner, and when to perform them, may include:

* Replacement of air conditioner filters.
	+ Replace when air filters show signs of being clogged. Clogging can cause significant airflow restrictions.
* Clean dirt and debris in and around air conditioner coils.
	+ Should be cleaned yearly or when there is significant dirt and debris in and around the coils.
* Comb coil fins back into near original conditions.
	+ Combing should be done when the aluminum fins on evaporators and condensers coils are bent and blocking airflow.
* Pass a stiff wire through a unit’s condensation drain channels.
	+ Should be done regularly in order to prevent the drain channels from becoming clogged.

Preventative maintenance of HVAC systems and equipment is the responsibility of the homeowner. However, licensed HVAC technicians should be the ones performing maintenance inspection and service tasks on the equipment. When a licensed HVAC technician is conducting a maintenance inspection, they have three main responsibilities:

1. Perform a series of inspections that could include the following:
	1. Check for correct amount of refrigerant
	2. Test for refrigerant leaks using a leak detector
	3. Capture any refrigerant that must be evacuated from the system, instead of illegally releasing it to the atmosphere
	4. Check for and seal duct leakage in central systems
	5. Measure airflow through the evaporator coil
	6. Verify the correct electric control sequence and make sure that the heating system and cooling system cannot operate simultaneously
	7. Inspect electric terminals, clean, and tighten connections, and apply a non-conductive coating if necessary
	8. Oil motors and check belts for tightness and wear
	9. Check the accuracy of the thermostat
	10. Check CO alarm
	11. Check for duct obstructions
2. After the inspection, identify any issues that causes the HVAC system to:
	1. Place occupants’ health and safety at risk
	2. Not be in compliance with building codes
	3. Not be in compliance with environmental regulations
	4. Contradict manufacturer’s instructions
	5. Cause manufacturer’s warranty to be voided
3. Report back to the customer with findings. Additionally, inform the customer of what corrective actions were taken, and what further actions are recommended. Lastly, inform them of the cost of those recommended actions.

After the inspection, the HVAC equipment’s required maintenance is then the responsibility of the homeowner. Corrective actions will either be included as maintenance items, or will require the homeowner’s authorization for performing service on the HVAC equipment. While most maintenance steps should only be performed by a licensed HVAC technician (e.g., equipment replacement, deep cleaning), there are steps that a homeowner is able and expected to perform on their own. It is also up to the homeowner to schedule regular inspections and maintenance with an HVAC technician.

**Problem Set 1.1:**

1. For a maintenance inspection, what are the responsibilities of a licensed HVAC contractor?
2. Who is ultimately responsible for providing preventative maintenance for a residence’s HVAC systems?
	1. The homeowner.
	2. A licensed and certified HVAC Technician.
	3. The HVAC Contractor who installed the equipment.
	4. All of the above.

**Learning Objective 1.2:**

* Memorize key terms relevant for preventative maintenance of HVAC systems.
* Identify problems that may be encountered when assessing HVAC system maintenance.

**Lecture Notes 1.2:**

Terms taken from the following documents: ACCA Standard 4: Maintenance of Residential HVAC Systems (4/8/2019):

[Quality Maintenance of Residential HVAC Systems - ANSI/ACCA 4 QM - 2019](https://www.acca.org/communities/community-home/librarydocuments/viewdocument?DocumentKey=1437374d-083c-464f-8619-8df20f558bf6)

ACCA Standard 6: HVAC Reconditioning for System Cleanliness and Indoor Air Quality (4/9/2021):

[Downloads - Public Files - ACCA](https://www.acca.org/communities/community-home/librarydocuments/viewdocument?DocumentKey=b0d7da58-e516-4af6-bf03-0e474d27081d)

DOE Energy Saver: Maintaining Your Air Conditioner
[Maintaining Your Air Conditioner | Department of Energy](https://www.energy.gov/energysaver/maintaining-your-air-conditioner)

[Common Air Conditioner Problems | Department of Energy](https://www.energy.gov/energysaver/common-air-conditioner-problems)

**Key Terms:**

Access: Means by which devices, appliances, and equipment use in order to reach their target location to be used in. Access may or may not first require opening an obstruction such as a panel or door.

Air distribution system: A network comprised of plenums, ducts, fittings, grilles, and registers that circulates air in a building to the HVAC system and recirculates the conditioned air back to the building.

Air filter: A device used to reduce the concentration of particles from the air by removing them as they pass through the HVAC system.

Air terminal unit: An appliance that receives, conditions, and delivers air through and HVAC system.

Ceiling plenum: A non-occupied portion of a building that is enclosed and facilitates the movement of air.

Containment: The practice of minimizing cross-contamination between afflicted and non-afflicted spaces.

Damper: A duct that regulates air flow to specific locations in a building.

Duct: Conduits that supply air to a HVAC system.

Duct system: A passageway comprised of ducts, duct fittings, dampers, and plenums for the transmission of air.

HEPA filter: High efficiency particulate air filter that removes 99.7% of particulates of 0.3 microns (µm) size

HVAC system: A system of devices and equipment’s that circulates air within a space. Includes at least one air-handling unit.

Inspect: The examination of an HVAC system and its components in order to assess its condition and performance.

Maintenance: Actions taking to preserve the functional integrity of an HVAC system in order for it to function effectively and efficiently.

Service Technician: A well-trained and licensed person who will find and fix problems in a HVAC system.

Maintenance program (for residential HVAC): A schedule designed for the maintenance of an HVAC system. Such program includes inspections, testing, measuring, and preserving the HVAC system.

Maintenance task: A predetermined task that serves the purpose of maintaining the physical condition of the HVAC system. Examples of such tasks include cleaning, measuring, and adjusting the components that make up the HVAC system.

Metering device: A device that meters refrigerant from a condenser into the evaporator.

Restoration: A cleaning process undertaken with the goal of improving an air conditioning system. Does not involve mechanical repairs on the HVAC system.

Return air: Air from a conditioned space that is re-circulated.

Return air system: A system in which return air is heated or cooled. Then it is conducted back to the supply unit.

Safety: The condition of being free of danger.

Service: To work a malfunctioning HVAC system, with the intention or making it fit for use.

Service task: A work item created from an inspection, or prior maintenance task. This includes both one time work operations, and operations that are part of a maintenance routine.

Test: To start a component, or system of components and compare its performance with manufacturer’s specifications or another approved standard.

**Problem Set 1.2:**

1. Match the terms with the correct definition.

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| 1) \_\_\_\_ A well-trained and licensed person who will find and fix problems in a HVAC system. | a) Access |
| 2) \_\_\_\_ The examination of an HVAC system and its components in order to assess its condition and performance. | b) Air Distribution System |
| 3) \_\_\_\_ The condition of being free of danger. | c) Air Filter |
| 4) \_\_\_\_ To start a component, or system of components and compare its performance with manufacturer’s specifications or another approved standard. | d) Air Terminal Unit |
| 5) \_\_\_\_ A device that meters refrigerant from a condenser into the evaporator. | e) Ceiling Plenum |
| 6) \_\_\_\_ A network comprised of plenums, ducts, fittings, grilles, and registers that circulates air in a building to the HVAC system and recirculates the conditioned air back to the building. | f) Containment |
| 7) \_\_\_\_ A work item created from an inspection, or prior maintenance task. This includes both one time work operations, and operations that are part of a maintenance routine. | g) Damper |
| 8) \_\_\_\_ Actions taking to preserve the functional integrity of an HVAC system in order for it to function effectively and efficiently. | h) Duct |
| 9) \_\_\_\_ A schedule designed for the maintenance of an HVAC system. Such program includes inspections, testing, measuring, and preserving the HVAC system. | i) Duct System |
| 10) \_\_\_\_ A predetermined task that serves the purpose of maintaining the physical condition of the HVAC system. Examples of such tasks include cleaning, measuring, and adjusting the components that make up the HVAC system. | j) HEPA Filter |
| 11) \_\_\_\_ Means by which devices, appliances, and equipment use in order to reach their target location to be used in. Access may or may not first require opening an obstruction such as a panel or door.  | k) HVAC System |
| 12) \_\_\_\_ High efficiency particulate air filter that removes 99.7% of particulates of 0.3 microns (µm) size | l) Inspect |
| 13) \_\_\_\_ The practice of minimizing cross-contamination between afflicted and non-afflicted spaces. | m) Maintenance |
| 14) \_\_\_\_ A cleaning process undertaken with the goal of improving an air conditioning system. Does not involve mechanical repairs on the HVAC system. | n) Service technician |
| 15) \_\_\_\_ An appliance that receives, conditions, and delivers air through and HVAC system. | o) Maintenance Program |
| 16) \_\_\_\_ To work a malfunctioning HVAC system, with the intention or making it fit for use. | p) Maintenance Task |
| 17) \_\_\_\_ A duct that regulates air flow to specific locations in a building. | q) Metering Device |
| 18) \_\_\_\_ A system in which return air is heated or cooled. Then it is conducted back to the supply unit. | r) Restoration |
| 19) \_\_\_\_ A device used to reduce the concentration of particles from the air by removing them as they pass through the HVAC system. | s) Return Air |
| 20) \_\_\_\_ Air from a conditioned space that is re-circulated. | t) Return Air System |
| 21) \_\_\_\_ Conduits that supply air to a HVAC system. | u) Safety |
| 22) \_\_\_\_ A passageway comprised of ducts, duct fittings, dampers, and plenums for the transmission of air. | v) Service |
| 23) \_\_\_\_ A non-occupied portion of a building that is enclosed and facilitates the movement of air. | w) Service Task |
| 24) \_\_\_\_ A system of devices and equipment’s that circulates air within a space. Includes at least one air-handling unit. | x) Test |