EPA Section 608
Study Guide

Table of Contents

- **Introduction 3**

Who is the EPA? 3
What are the requirements for HVAC contractors? 3

- **Basic EPA Certification 4**

Introduction 4
History 4
Environmental Protection Agency (EPA) 4
Our Role 4
The Ozone Layer 4
Ozone Depletion 5
Different compounds 5
Effects 5
What is being Done? 5
The Clean Air Act 5
New Refrigerants/Same Rules 5
Compliance 6
Conclusion 6

- **EPA Certification, Type I & II 7**

Definitions 7
Leak Symptoms/Repairs 7
Safety 7
Must Do's/ Don't's 8
Summary 8
EPA Leak Regulations 8
Refrigeration Systems 9

- **EPA Certification, Type III 10**

Introduction 10
Leak Checking 10
Purge Units 10
Charging 10
Evacuation Requirements 11

CHAPTER 1

Introduction

Who is the EPA?

The Environmental Protection Agency (EPA) is an agency of the United States government. This agency regulates the sale and use of all refrigerants

What are the requirements for HVAC contractors?

Technicians servicing products must be certified under the proper category:

TYPE I- Small appliances, Systems containing under 5 pounds of refrigerant

TYPE II- Most residential split systems (containing less than 50 pounds of refrigerant)

TYPE III- Any system containing more than 50 pounds of refrigerant (ex: chillers)

CHAPTER 2

Basic EPA Certification

Introduction

In 1974, research theorized that chlorine compounds might be destroying the ozone layer above the earth. These compounds are present in many of the refrigerants used today and represent a global problem.

History

Modern refrigeration, much as it is today, began with the introduction of chloro-flourocarbons (CFC's) in the early 1930's.

Environmental Protection Agency (EPA)

In 1978, the EPA banned the use of CFC's as aerosol propellants (except for some medicines). At one time over 50% of the total consumption of CFC's in this country were for aerosols.

Our Role

- To be informed
- To be skilled
- To be certified
- To be in compliance

The Ozone Layer

Ozone consists of 3 oxygen atoms in each molecule as opposed to 2 in air-borne oxygen
It acts as a shield against UV radiation
At ground level it is considered a pollutant and harmful
It forms at ground level when UV rays act on smog

Ozone Depletion

There are many theories about the causes of ozone depletion, but it is known that certain chemicals do contribute to damage to the ozone layer
The chlorine atoms from CFC's are among the worst offenders of all man made chemicals
Chlorine atoms combine with the ozone molecules to break it down to oxygen
CFC's do not dissolve in water and do not break down even years later
Each chlorine atom can destroy up to 100,000 ozone molecules

Different compounds

CFC's are considered to be the most harmful to the ozone layer (R-12 for example)
HCFC's are less harmful but still represent a threat (R-22)
HFC's do not pose a threat to the ozone layer but do have a global warming potential (R134A, R410A)

Effects

Depletion of the ozone layer has resulted in an increase in UV radiation and,
damage to marine life
crop damage
increased skin cancers
increased cataracts
global warning

What is being Done?

Capturing and ultimately eliminating CFC's and HCFC's
Using cleaner burning fuels
Enforcing strict requirements on incinerators
Enforcement of the clean air act

The Clean Air Act

Prohibits venting of refrigerants
Requires the recovery of refrigerants before appliance disposal
Calls for the phase out of CFC's and HCFC's
Levies fines for non-compliance

New Refrigerants/Same Rules

CFC's (Class I), HCFC's (CLASS II) and HFC's all need to be recovered
Recovery equipment must be certified by the EPA
Are illegal to knowingly release into the atmosphere (except de minimus during service)

Compliance

Violations may lead to fines, loss of certification, and possible court proceedings
Awards of up to 10,000.00 may be paid to informants
Fines up to 27,500 per day for violations

Conclusion

While some natural occurrences contribute to ozone depletion, CFC's have a much greater potential for damage.
Ongoing research has measured CFC's in air samples from the stratosphere

CHAPTER 3

EPA Certification, Type I & II

Definitions

Small Appliances are products containing less than 5 pounds of refrigerant and charged and hermetically sealed by the factory
Technicians certified as “Type I” or as “Universal” may service, repair or recover the refrigerant contained in a small appliance
MVAC is not included in this category

Leak Symptoms/Repairs

While not mandatory, leaks should be repaired when found
Before recovery you must know the type of refrigerant in the system to avoid cross contamination
Recovery equipment must be able to recovery 90% of the charge and 4” vacuum with a working compressor (80% with non working compressor)
Passive recovery captures refrigerant in a non-pressurized container
The compressor must be heated and struck to release trapped refrigerant in the oil
If the compressor doesn’t run, the system needs to have access valves on the high as well as low side
Nitrogen tanks must have a regulator

Safety

Refrigerants may form phosgene gas when heated
Equipment must have low loss fittings or hand valves
Only freon type refrigerants should be recovered
Cylinders should not be stored above 125*F

Must Do's/ Don'ts

Systems with 134a or 410a must have a dedicated set of gauges and recovery cylinders
Don't mix refrigerants or oils
Do use approved recovery cylinders they are color coded with a band on the top
Do have them tested every 5 years
Do not exceed 80% of the w.c.

Summary

Traces of oil may indicate a leak
It is ok to use nitrogen for pressure checking type I or II products after they have been recovered
A small amount of R-22 may be added to nitrogen for leak checking and does not need to be recovered

EPA Leak Regulations

Comfort equipment containing more than 50# of refrigerant must be repaired when the leak exceeds 15% per year
Commercial refrigeration leak rate is 35% for cold storage equipment in restaurants ice plants and supermarkets
Refrigerant monitors are mandatory in equipment rooms using all types of refrigerants

Refrigeration Systems

Moisture is removed by a filter drier on the liquid line (high Pressure)
Large amounts of moisture may need to have nitrogen added to reduce freezing during vacuuming
Deep vacuums are measured in microns
Evacuation removes non-condensables, which raise discharge pressure
Too large a vacuum pump may cause freezing of trapped water
Recovered refrigerant may contain oil, moisture and acids (from a compressor burnout
Recovering refrigerant in the liquid phase will speed up the recovery process, but will result in the loss of oil in the system
Vapor recovery is slower but does it without pulling oil
from the system
Recovery cylinders should be evacuated before initial use

CHAPTER 4

EPA Certification, Type III

Introduction

Systems containing more than 50 Pounds of refrigerant
Generally use semi-hermetic compressors
May be high or low- pressure systems
May include absorption chillers

Leak Checking

Open drive compressors should be checked at the drive shaft seal area first
Low- pressure systems often have air leaks at gaskets and fittings
High head pressure is a good indicator of a leak
Never pressure test low pressure systems with more than 10 psig of pressure
Hydrostatic test kits will determine if a tube leaks
Leak detectors can be inserted into a drain valve to test for freon leaks in the water box
After recovering all the liquid freon possible, the vapor must be recovered completely, nearly 100# may still remain

Purge Units

Remove non-condensables
Can be manual or motorized
Excessive running of a motorized purge system indicates a leak
High efficiency units discharge very little refrigerant with each purge

Charging

Charging with liquid into a system under a vacuum will cause the water to freeze
Water must be circulated through the chiller when evacuating to prevent freezing

Heating a refrigerant bottle may speed vapor charging

Evacuation Requirements

Type III equipment must be evacuated to 25” hg
After evacuation you must wait several minutes to see if the pressure rises (refrigerant could be trapped in the oil)
Remember, low pressure systems may operate in a vacuum
At 30 to 35 degrees the pressure could be 10 to 12” hg.