

Purpose

The purpose of this standard operating procedure is to standardize the information required for refrigerant-containing appliance maintenance, recordkeeping, and reporting for compliance of the following EPA regulations:

- 40 CFR 82.34, *Prohibitions and required practices*
- 40 CFR 82.36, *Approved refrigerant handling equipment*
- 40 CFR 82.40, *Technician training and certification*
- 40 CFR 82.156, *Proper evacuation of refrigerant from appliances*
- 40 CFR 82.157, *Appliance maintenance and leak repair*
- 40 CFR 82.158, *Standards for recovery and/or recycling equipment*
- 40 CFR 84.106, *Leak Repair*

For the purposes of this procedure, maintenance is a service or repair that involves adding or removing refrigerant from an appliance.

The procedures are applicable to refrigerant-containing appliances that:

contain 50 pounds or more of class I, class II, or a blend containing a class I or class II refrigerant *per circuit*

OR

contain 15 pounds or more of an HFC, a blend containing an HFC, or a substitute with a GWP greater than 53 *per circuit*.

It also addresses small appliances (*charge is less than or equal to 5 pounds of refrigerant per circuit*), motor vehicle air conditioners (MVAC), and MVAC-like appliances.

Scope & Procedures

This procedure applies to all University employees, contractors, and vendors that perform maintenance on the types of appliances listed above or maintain automatic leak detection systems.

Responsible personnel ensure the work instructions in AQ-WI-201 are followed; the form AQ-FORM-201 is completed; and the form is submitted to UK's Air Quality Compliance Specialist (AQCS), [Leo Smart](mailto:leo.smart@uky.edu), at leo.smart@uky.edu.

The AQCS must enter records into the University's refrigerant tracking system, SPHERA.

Responsible Personnel

- The EPA Certified Technician (40 CFR 82, Subpart F) conducting repairs.
- The supervisor in charge of operating the equipment is ultimately responsible for ensuring the appropriate forms are completed by any contractor or vendor and submitted to the AQCS.
- The AQCS ensures records are added in SPHERA and properly maintained.

Associated Work Instructions and Forms

AQ-WI-201 and AQ-FORM-201

Supporting Document

Refrigerant Management Plan

University of Kentucky – Work Instructions for Maintenance, Repair, and Leak Testing of Refrigerant-Containing Appliances (AQ-WI-201)

Purpose

The purpose of these instructions is to describe the EPA maintenance, repair, leak testing, recordkeeping, and reporting requirements for refrigerant-containing appliances whenever refrigerant is added or removed from the appliance. This includes when form AQ-FORM-201 must be submitted.

Scope

These instructions apply to all University employees, contractors, and vendors that perform maintenance, repairs, or leak testing on the types of appliances described in AQ-PROC-200, small appliances (*charge is less than or equal to 5 pounds of refrigerant per circuit*), or motor vehicle air conditioners (MVAC) or MVAC-like Appliances.

Responsible Personnel

Responsible personnel must follow these work instructions; complete form AQ-FORM-201; and submit the form to UK's Air Quality Compliance Specialist (AQCS), **Leo Smart**, at leo.smart@uky.edu. Responsible personnel include:

- The EPA Certified Technician (40 CFR 82, Subpart F) that added or removed refrigerant from the appliance, repaired leaks, or tested for leaks. This includes the initial refrigerant charge.
- Technicians working on small refrigerant appliances where the full charge is less than or equal to 5 pounds of refrigerant per circuit.
- The AQCS in charge of the refrigerant tracking system, recordkeeping, and reporting notices to EPA.

Associated Standard Operating Procedure and Form

AQ-PROC-200 and AQ-FORM-201

Work Instructions

General Requirements for Maintenance of Refrigerant Appliances

- No person shall knowingly release or dispose of any refrigerant into the environment. Contact the AQCS immediately if this occurs.
- If maintenance could reasonably be expected to impact the integrity of a refrigerant circuit and release refrigerant to the environment, the work must be conducted by an EPA certified technician. Exception: *Use of a certified technician is not required to evacuate a small appliance (charge is less than or equal to 5 pounds of refrigerant per circuit).*
- Refrigerant may be returned to the same appliance or another appliance owned by the University without being recycled or reclaimed.
- Copies of all University employee technician certifications must be retained on file with the technician's specific Department and a copy submitted to the AQCS.
- Employees of contractors and vendors must supply technician certification to the AQCS.

Recovery and/or Recycling Equipment Requirements

- Must be used before opening an appliance.
- Must be certified in accordance with 40 CFR 82.36, 32.158(f), or 82.158(g) as appropriate.
- Proper operation per manufacturer's instructions is required unless the directions conflict with the requirements of the governing regulation.
- Appliances that contain pump-out units are exempt from the requirement to use certified, self-contained recovery and/or recycling equipment.

University of Kentucky – Work Instructions for Maintenance, Repair, and Leak Testing of Refrigerant-Containing Appliances (AQ-WI-201)

Evacuation Requirements

- The required percentage of refrigerant evacuated or vacuum level that must be achieved is listed in 40 CFR 82.156.
- System-dependent equipment may not be used with appliances with a full charge of more than 15 pounds of refrigerant unless the equipment is permanently attached to the appliance as a pump-out unit.
- Appliances that contain pump-out units are exempt from the requirement to use certified, self-contained recovery and/or recycling equipment.

Maintenance Requirements of Appliances Described in AQ-PROC-200

Form AQ-FORM-201 must be completed for maintenance on these types of appliances. **Technicians must complete Sections I – V of AQ-FORM-201 as appropriate and submit it to the AQCS. The future of an appliance may not be known at the time of a leak rate calculation. Whenever work is performed or decisions made, the technician must submit an amended form to the AQCS.**

Maintenance Requirements of Appliances Small Appliances

For appliances with less than or equal to 5 pounds of refrigerant per circuit and those not described in AQ-PROC-200, follow the general requirements for maintenance of refrigerant appliances. The technician does not need to be EPA certified and use of form AQ-FORM-201 is not required.

Maintenance Requirements of Motor Vehicle Air Conditioners (MVAC) or MVAC-like Appliances

Recovery and/or recycling equipment requirements

- Must be certified in accordance with 40 CFR 82.36, 82.158(f), or 82.158(g) as appropriate.
- Operated by an EPA certified MVAC technician (40 CFR 82.40).
- Proper operation per manufacturer's instructions is required unless the directions conflict with EPA requirements (40 CFR 82.32(e)).

Recordkeeping requirements

- Records of the name and address of any facility to which refrigerant is sent must be maintained and retained for five years by the University seller. Form AQ-FORM-201 is not required.

SECTION I – Appliance and Technician Information

EPA certified technician completes this section when maintenance is performed.

SECTION II – Appliance Leak Rate Calculation Requirement

Technician completes this section when refrigerant is removed from or added to an appliance.

- Whenever refrigerant is evacuated from an appliance, it must be recorded. Further, when refrigerant is added, the rate at which refrigerant leaked out of the unit must be calculated. **Contact the AQCS immediately if you need help calculating the leak rate.**
 - Note, if refrigerant is added immediately following a retrofit, due to installation of a new appliance, or as part of a seasonal variance, the leak rate calculation is not required. However, records of seasonal variance and destroyed purged refrigerant are tracked to exclude from the leak rate calculation. Contact the AQCS to provide this information.
- Appliances leaking over the allowable leak rate as listed below must have leaks repaired unless the appliance is retrofitted or retired:
 - 20% leak rate for commercial refrigerant equipment;
 - 30% leak rate for industrial process refrigeration equipment; or
 - 10% leak rate for comfort cooling appliances or other appliances not covered.

SECTION III – Appliance Mothball Requirements

Technician completes and submits this section when a leak rate exceeds the allowable and the appliance is mothballed. Leaks must be inspected and repaired within 30 days of when refrigerant is added to an appliance. The time frame is temporarily suspended if an appliance is mothballed and resumes (not restarts) on the day additional refrigerant is added. If mothballed, the technician completes Sections I-III and submits it to the AQCS.

SECTION IV – Leak Repair Requirements

Technician completes and submits when leak inspections, repairs, or verification tests are performed. The University uses the Annualizing Method to determine the leak rate. This method allows for repairing leaks so the rate falls below the limit but does not require the repair of all leaks.

Leak Inspections

- Leaks must be inspected and repaired within 30 days of when refrigerant is added to an appliance.
- Repairs must bring the leak rate below the allowable leak rate, which is confirmed using the leak rate calculation on AQ-FORM-201 the next time refrigerant is added. Leaks are considered repaired if no refrigerant is added for 12 months after the repair or an annual leak inspection does not find any leaks.

Initial Verification Tests Requirements for Leak Repairs

- An initial verification test of the repair must be performed within 30 days of exceeding the allowable leak rate.
- For repairs completed without opening or evacuating the appliance, the test must be performed after the conclusion of the repair(s) and before any additional refrigerant is added.
- For repairs that require the evacuation of the appliance or a portion of the appliance, the test must be performed before adding any refrigerant to the appliance.
- If the initial verification test indicates that repairs have not been successful, additional repairs and initial verification tests can be completed within the time period.
- An extension of the 30-day timeframe for leak inspections and verification tests must be requested from EPA; contact the AQCS immediately if this is needed. Extensions are only granted if the appliance is located in an area subject to radiological contamination; other Federal, state, or local regulations make repair impossible; or replacement components are unavailable.

Follow-up Verification Tests Requirements for Leak Repairs

- A follow-up verification test must be performed within 10 days of a successful initial verification test or 10 days of the appliance reaching normal operating characteristics and conditions.
- A follow-up verification test must demonstrate that leaks where a repair attempt was made are repaired. If the follow-up test indicates that the repairs were not successful, additional repairs and verification tests can be completed within the time period to verify the repairs.
- If the repair to the leak fails to bring the leak rate below the applicable leak rate, a retrofit or retirement plan must be created and implemented. Contact the AQCS if this is needed.
- Certified technician completes form AQ-FORM-201 and submits it to the AQCS.

Annual Leak Inspection Requirements

- An appliance that had a leak rate over the allowable leak rate, must have an annual leak inspection until it is shown through leak rate calculations that the appliance has not exceeded the leak rate for one year. An annual inspection is not required if the appliance is monitored by

University of Kentucky – Work Instructions for Maintenance, Repair, and Leak Testing of Refrigerant-Containing Appliances (AQ-WI-201)

an automatic leak detection system that is annually calibrated or audited and meets the operating requirements of the regulation. To use this exemption, contact the AQCS for details of the requirements before the annual inspection is due.

- Certified technician completes form AQ-FORM-201 and submits it to the AQCS.

SECTION V – Appliance Retrofit or Retirement Requirements

Technician completes and submits for an appliance retrofit or retirement plan.

- Retrofit or retirement plans must be created within 30 days of an appliance leaking above the allowable leak rate when:
 - The decision is made to retrofit or retire the appliance rather than repair the leak(s);
 - No actions are taken to identify or repair leak(s); or
 - The appliance continues to leak above the leak rate after the repairs and verification tests to repair the leak.
- The retrofit or retirement plan must be signed and dated by the responsible official and available for EPA inspection.
- All identified leaks must be repaired as part of any retrofit plan.
- Unless granted additional time, all work performed in the plan must be finished within one year of the plan's date (not to exceed 12 months).
- A request can be made to EPA to relieve the obligation to retrofit or retire the appliance if it can be established within 180 days of the plan's date that the appliance no longer exceeds the applicable leak rate and the responsible official agrees in writing to repair all identified leaks within one year of the plan's date. Contact the AQCS for specific requirements if this is needed.

Recordkeeping and Reporting Requirements

- Maintenance records must be completed by the technician on AQ-FORM-201 and submitted to the AQCS.
- An appliance that leaks 125% or more of the full charge in a calendar year must be reported to EPA by March 1 of the following year. The AQCS will draft a report based on the leak rates provided by the technician.
- A justification for an extension beyond 30 days for initial verification tests must be submitted to EPA as soon as possible. Contact the AQCS immediately if this occurs.
- A plan for retrofit, retirement, or relief from both must be submitted to EPA within 30 days of a leak. Contact the AQCS immediately if this occurs.
- The AQCS updates the refrigerant tracking system and reports notices to EPA.
- All records must be maintained for five years.

University of Kentucky – Required Form for Maintenance, Repair, and Leak Testing of Refrigerant -Containing Appliances (AQ-FORM-201)

SECTION I – Appliance and Technician Information

University Equipment ID #: If unknown, complete and attach AQ-FORM-101	Circuit #:
UK Work Order #: UK PO #:	
Date of Maintenance: ____/____/____ Maintenance due to automatic leak detection equipment: [Y / N] Date of last automatic leak detection equipment calibration (if applicable): ____/____/____	
Part(s) of appliance being serviced:	Type of maintenance for each part(s):
Contractor/Vendor: EPA Certified Technician Name/ID: Technician Email/Phone:	

SECTION II – Appliance Leak Rate Calculation

Circuit Full Charge: ____ lbs. ____ oz.	Refrigerant Name(s):
Refrigerant Evacuated: [Y / N] Date Refrigerant Evacuated: ____/____/____ Quantity Evacuated: ____ lbs. ____ oz. UK Cylinder ID(s) : Note if vendor supplied	Refrigerant Added: [Y / N] Date Refrigerant Added: ____/____/____ Quantity Added: ____ lbs. ____ oz. UK Cylinder ID(s) : Note if vendor supplied
Net refrigerant added (refrigerant added minus refrigerant evacuated): ____ lbs. ____ oz. Prior date refrigerant added due to maintenance: ____/____/____ Number of days between current refrigerant added data and prior added date: _____	
$\text{Leak Rate} = \frac{\text{net refrigerant added (lbs)}}{\text{refrigerant full charge (lbs)}} \times \frac{365 \text{ days/year}}{\text{shorter of the number of days since refrigerant addition OR 365}} \times 100\%$	
Leak Rate: _____ % per year	
If the leak rate exceeds 30% for industrial process refrigeration, 20% for commercial refrigeration, or 10% for comfort cooling or other refrigeration types, one of the following sections must be completed. Technicians will need to submit an amended form when the status changes: SECTION III – Appliance Mothballed SECTION IV – Leak Repaired SECTION V – Appliance Retrofitted or Retired	

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SECTION III – Appliance Mothball Requirements

Date Mothballed: ____/____/____
 30-day repair timeframe suspended on this date

Quantity Evacuated: _____lbs. ____oz.

UK Cylinder ID(s) :
 Note if vendor supplied

Date Refrigerant Added: ____/____/____
 30-day repair timeframe continues – does not restart

Quantity Added: _____lbs. ____oz.

UK Cylinder ID(s) :
 Note if vendor supplied

SECTION VI – Leak Repair Requirements

Leak Inspections

Date(s) of Leak Inspection: ____/____/____

Submit all inspection dates done within the 30-day timeline

Method(s) to determine appliance leak(s) (i.e. sight glass checks, viewing receiver levels, pressure checks):

Method(s) to conduct leak inspection (i.e. ultrasonic tests, bubble tests):

Location of Each Leak:

All visible and accessible parts of appliance were inspected. [Y / N]

Initial Verification Tests

Date(s) of Verification Test: ____/____/____

Submit all verification dates done within the 30-day timeline

Method(s) to determine appliance leak(s) (i.e., sight glass checks, viewing receiver levels):

Result of Initial Verification Test(s):

Annual Leak Inspection

Date of Annual Leak Inspection: ____/____/____

Date of Last Leak Rate Exceeded: ____/____/____

Method(s) to determine if appliance is leaking (i.e. sight glass checks, viewing receiver levels, pressure checks):

Method(s) to conduct leak inspection (i.e. ultrasonic tests, bubble tests):

Location of Each Leak:

All visible and accessible parts of appliance were inspected. [Y / N]

Follow-Up Verification Test

Date of Follow-Up Verification Test: ____/____/____

Complete within 10 days of initial verification or return to normal operating condition

Method(s) to determine appliance leak(s) (i.e., sight glass checks, viewing receiver levels):

Result of Follow-Up Test(s):

University of Kentucky – Required Form for Maintenance, Repair, and Leak Testing of Refrigerant -Containing Appliances (AQ-FORM-201)

SECTION V – Appliance Retrofit or Retire Requirements

Retrofit	Retire
Converted Refrigerant Name(s): Appliance Full Charge: _____lbs. ____oz.	Plan for disposing of recovered refrigerant:
Itemized changes to appliance for compatibility with new refrigerant:	
Plan for disposing of recovered refrigerant:	Plan for disposal of appliance:
Identification of all appliance leaks: All leaks must be repaired for retrofit.	
Retrofit Schedule:	Retirement Schedule:
Extension Request	Relief Request
Estimated date of completion: ____/____/____	Trigger date of retrofit/retire: ____/____/____
Description and date of any repair work performed prior to extension request:	Description of completed repairs:
Detailed plan to complete retirement/retrofit:	Description of incomplete repairs:
Description of why more than one-year is needed:	Description of why repairs were not completed within 30-days or within extension date:
	Date when all repairs will be completed: ____/____/____

Submit completed form to Air Quality Compliance Specialist, Leo Smart at Leo.Smart@uky.edu