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The Environmental Protection Agency

**COMPLYING WITH REGULATIONS CONTROLLING FLUORINATED
GREENHOUSE GASES AND OZONE DEPLETING SUBSTANCES**

A GUIDANCE NOTE FOR CONTRACTORS IN THE

**Refrigeration, Air-conditioning
and Heat Pump Sector**

Environmental Protection Agency

The Environmental Protection Agency (EPA) is a statutory body responsible for protecting the environment in Ireland. We regulate and police activities that might otherwise cause pollution. We ensure there is solid information on environmental trends so that necessary actions are taken. Our priorities are protecting the Irish environment and ensuring that development is sustainable.

The EPA is an independent public body established in July 1993 under the Environmental Protection Agency Act, 1992. Its sponsor in Government is the Department of the Environment, Heritage and Local Government.

OUR RESPONSIBILITIES

Licensing

We license the following to ensure that their emissions do not endanger human health or harm the environment:

- waste facilities (e.g., landfills, incinerators, waste transfer stations);
- large scale industrial activities (e.g., pharmaceutical manufacturing, cement manufacturing, power plants);
- intensive agriculture;
- the contained use and controlled release of Genetically Modified Organisms (GMOs);
- large petrol storage facilities;
- waste water discharges.

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- Conducting over 2,000 audits and inspections of EPA licensed facilities every year.
- Overseeing local authorities' environmental protection responsibilities in the areas of – air, noise, waste, waste-water and water quality.
- Working with local authorities and the Gardai to stamp out illegal waste activity by co-ordinating a national enforcement network, targeting offenders, conducting investigations and overseeing remediation.
- Prosecuting those who flout environmental law and damage the environment as a result of their actions.

Monitoring, Analysing and Reporting on the Environment

- Monitoring air quality and the quality of rivers, lakes, tidal waters and ground waters; measuring water levels and river flows.
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Regulating Ireland's Greenhouse Gas Emissions

- Quantifying Ireland's emissions of greenhouse gases in the context of our Kyoto commitments.
- Implementing the Emissions Trading Directive, involving over 100 companies who are major generators of carbon dioxide in Ireland.

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- Co-ordinating research on environmental issues (including air and water quality, climate change, biodiversity, environmental technologies).

Strategic Environmental Assessment

- Assessing the impact of plans and programmes on the Irish environment (such as waste management and development plans).

Environmental Planning, Education and Guidance

- Providing guidance to the public and to industry on various environmental topics (including licence applications, waste prevention and environmental regulations).
- Generating greater environmental awareness (through environmental television programmes and primary and secondary schools' resource packs).

Proactive Waste Management

- Promoting waste prevention and minimisation projects through the co-ordination of the National Waste Prevention Programme, including input into the implementation of Producer Responsibility Initiatives.
- Enforcing Regulations such as Waste Electrical and Electronic Equipment (WEEE) and Restriction of Hazardous Substances (RoHS) and substances that deplete the ozone layer.
- Developing a National Hazardous Waste Management Plan to prevent and manage hazardous waste.

Management and Structure of the EPA

The organisation is managed by a full time Board, consisting of a Director General and four Directors.

The work of the EPA is carried out across four offices:

- Office of Climate, Licensing and Resource Use
- Office of Environmental Enforcement
- Office of Environmental Assessment
- Office of Communications and Corporate Services

The EPA is assisted by an Advisory Committee of twelve members who meet several times a year to discuss issues of concern and offer advice to the Board.

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Introduction

This Guidance Note is published by the Environmental Protection Agency and is aimed at assisting contractors and in-house technical personnel working on refrigeration, air-conditioning and heat pump equipment to comply with the EC F-gas and ODS Regulations in the Republic of Ireland.

The EC F-gas and ODS Regulations are European Regulations that are directly in force in all EU Member States. They came about as a result of two global environmental agreements: the Kyoto Protocol and the Montreal Protocol. The purpose of these two protocols is to reduce the impact of greenhouse gases, including fluorinated greenhouse gases (F-gases) on climate change and ozone depleting substances (ODS) on the ozone layer, by reducing emissions of F-gases and ODS respectively.

This guidance will assist contractors and in-house technical staff providing technical services to operators of refrigeration, air-conditioning and heat pump (RAC) equipment containing F-gases or ODS to comply with all requirements of the legislation. It begins with a summary of the legislation, followed by details on the key obligations and an overview of best practice. Further useful resources are presented in the Appendices.

1. What are the EC F-gas and ODS Regulations?

1.1 F-gas Regulation

Fluorinated greenhouse gases (F-gases) are very powerful greenhouse gases that contribute to climate change if emitted to the atmosphere. F-gases include hydrofluorocarbons (HFCs) which are commonly used as refrigerants.

The EC F-gas Regulation (No. 842/2006) on certain fluorinated greenhouse gases – aims to reduce emissions of HFCs, PFCs and SF₆.¹ The key requirements in this Regulation applied from July 2007 and are directly binding in all Member States. Irish Regulations² will be published to give further effect in Ireland to specific elements of the F-gas Regulation.

For help with abbreviations and definitions of terms see Appendix 1 and for other sources of information see Appendix 2.

1.2 ODS Regulation

Ozone-Depleting Substances (ODS) are chemicals that can damage the earth's ozone layer if they escape into the upper atmosphere. ODS include hydrochlorofluorocarbons (HCFCs), which are still in use as refrigerants in many building air-conditioning systems and refrigeration systems.

The EC ODS Regulation (No. 1005/2009) on substances that deplete the ozone layer replaces an earlier regulation (Regulation EC No. 2037/2000). The key requirement of the Regulation is the phasing-out of the use of ODS. The only ODS still widely in use are HCFC refrigerants, especially R22 and blends such as R408A. The use of virgin HCFCs

in maintenance and servicing of refrigeration and air-conditioning equipment is banned since the end of 2009. Recycled and reclaimed HCFCs can continue to be used until the end of 2014.

Regulation (EC) No 2037/2000 was given further effect in Ireland by the Control of Substances that Deplete the Ozone Layer Regulations 2006 (S.I. No. 281 of 2006). These regulations are being revised in light of the new ODS Regulation referred to above³.

1.3 What equipment uses F-gases and ODS?

Typically this covers three different types of **stationary** equipment:

Refrigeration systems

Equipment to cool products or storage spaces below ambient temperature

Air-conditioning systems

Equipment to cool buildings to a comfortable ambient temperature

Heat pumps

Heating devices that use a refrigerant circuit to extract energy from a waste heat source and deliver useful heat – cooling is also available in reversible systems.

¹ Hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.

² It is the obligation of the reader to ensure to refer to the most current legislation. The Irish Regulations, when published, will be available on the website of the Department of Environment, Heritage and Local Government www.environ.ie.

³ *Ibid.*

1.4 Some common F-gases and ODS in use

Many organisations are major users of refrigerants that contain F-gases or ODS and are therefore affected by both these Regulations. The following table lists some of the most common refrigerants and shows which Regulations are relevant to each. See Appendix 3 for a more extensive listing.

Table 1: Some common F-gases and ODS

Refrigerant	Type	EC F-gas Regulation	EC ODS Regulation
R22	HCFC	✗	✓
R408A	HCFC + HFC Blend	✓	✓
R134a	HFC	✓	✗
R404A	HFC Blend	✓	✗
R407C	HFC Blend	✓	✗
R410A	HFC Blend	✓	✗
Ammonia	Natural	✗	✗
CO ₂	Natural	✗	✗

2. Key Obligations for Contractors and Operators

This section provides a summary of each of the key obligations under the EC F-gas and ODS Regulations relating to contractors and operators, followed by a more detailed introduction to each of the obligations.

Contractors are responsible for ensuring that they only employ technicians/engineers with the appropriate level of qualification and are themselves certified. Contractors may also be considered operators in certain circumstances depending on their contractual arrangements with the end-users, in which case they must also comply with operator obligations under the Regulations. In addition there is specific legislation covering the handling of waste refrigerant that arises during servicing, maintenance and dismantling of RAC equipment which contractors have to deal with.

Operators are responsible for ensuring that they comply with specific obligations under the EC F-gas and ODS Regulations. Qualified RAC contractors will normally carry out maintenance and servicing activities, responsibly and appropriately, on behalf of the operator, to ensure that the operator is compliant with their obligations.

2.1 Who is the operator?

The operator may be, but is not necessarily, the owner of the refrigeration, air-conditioning and heat pump equipment. The operator is defined in relation to F-gases as "... the natural or legal person exercising actual power over the technical functioning of the equipment and systems ...".

To help answer this question the European Commission issued guidance in 2008 which states that the "actual power over the technical functioning" of a piece of equipment or system must include each of the following elements:

- Free access to the system, which entails the possibility to supervise its components and their functioning, and the possibility to grant access to third parties;
- The control over the day-to-day functioning/running (e.g. take the decision to switch it on or off); and,
- The powers (including financial power) to decide on technical modifications (e.g. replacement of a component), modification of the quantities of F-gases in the system, and to have checks or repairs carried out.

If **all** of these elements are transferred to a third party through contractual arrangements then the responsibility for compliance with operator requirements will likely rest with the third party, depending on how the contract is set up. For example, a supermarket retail chain will be the operator, unless the supermarket chain has formally and contractually devolved all responsibility to another party, such as a contractor. For many organisations, the end-user is both the owner and the operator.

2.2 Summary of the Key Obligations

The EC F-gas and ODS Regulations require operators to take steps to prevent F-gas and ODS leakage and repair detected leakage as soon as possible. Operators employ contractors to undertake these activities on their behalf so it is necessary that contractors understand these obligations and ensure they are complied with.

The key obligations are:

1. Training and certification

Ensure that technicians/engineers have the required qualifications; and,

Ensure that businesses that employ technicians/engineers hold company certification (www.fgrasregistration.ie).

2. Containment

Check equipment for leaks in accordance with the required frequency, depending on the size of the refrigerant fluid charge. Refer to Table 2 for more information;

Fit automatic leak detection on systems containing 300 kg or more of HFCs; and,

Keep records for all systems containing 3 kg or more of F-gases and ODS.

3. Recovery and waste management

Recover HFCs/HCFCs during servicing and maintenance;

Comply with waste management legislation in relation to the transport of waste gases; and,

Comply with legislation in relation to waste electrical and electronic equipment (WEEE).

4. Labelling

Label new equipment adjacent to service point/information and in instruction manuals.

5. Placing on the market

Only use HFCs/HCFCs in refillable containers.

6. HCFC phase out

Comply with phase outs of HCFC refrigerants. The ban on the use of virgin HCFC began on 31 December 2009 and the ban on the use of reclaimed or recycled HCFC will begin on from 31 December 2014.

3. Key Obligations Explained

This section contains details of the key obligations that apply to RAC contractors and to operators of RAC equipment. Operator obligations may be applicable to RAC contractors in certain contractual circumstances.

3.1 Training and Certification

a. Contractors must only employ and operators must only use engineers/technicians with suitable qualifications

F-gases

In addition to the EC F-gas Regulation, the implementing Commission Regulation (EC) No. 303/2008, sets out minimum qualifications for personnel working on stationary RAC systems that contain or are designed to contain HFCs. This Regulation refers to four different levels of certification, which allow personnel to carry out different activities. These are:

1. **Category I** certificate holders may carry out **all** of the following activities for any size of RAC systems containing HFC refrigerants – **leak checking, refrigerant recovery, installation, maintenance and servicing.**
2. **Category II** certificate holders may carry out refrigerant recovery, installation, maintenance and servicing, in relation to RAC systems **containing less than 3 kg** of fluorinated greenhouse gases (or less than 6 kg for systems that are hermetically sealed). Category II certificate holders may also carry out leak checks on any plant provided that it does not entail breaking into the refrigeration circuit containing fluorinated greenhouse gases.

3. **Category III** certificate holders may carry out **refrigerant recovery** in relation to RAC systems **containing less than 3 kg** of fluorinated greenhouse gases (or less than 6 kg for systems that are hermetically sealed).
4. **Category IV** certificate holders may carry out **leak checks** on any plant provided that it does not entail breaking into the refrigeration circuit containing fluorinated greenhouse gases.

The Further Education and Training Awards Council (FETAC) has developed, in conjunction with relevant stakeholders, a national specification for F-gas and ODS certification for stationary RAC qualifications that meets the minimum requirements of F-gas Regulation – FETAC Level 5 (Special Purpose Certificate in Handling F-gas Refrigerants 5S0108).

Further details on the FETAC courses are available at www.fetac.ie and www.refrigerationskillnet.ie. This qualification is to the same standard as the City and Guilds (Level 2 Award in F-gas Regulation, No.2079).

These qualifications will be accepted in Ireland and by other Member States under mutual recognition obligations. Individuals must obtain the relevant certification by 4 July 2011. In the meantime interim arrangements will apply. See Table 1 and Appendix 2 for additional details.

ODS

The requirement for those contractors working with HCFCs (ODS) is to hold either *City and Guilds Certificate in Handling Refrigerants Scheme 2078* or the appropriate category of F-gas qualification for the work to be undertaken.

Table 2: City and Guilds and FETAC F-gas Qualifications

Level	City and Guilds 2079	FETAC 550108
Category I	2079-11 City and Guilds NDAQ Ref No 500/5730/3 NFQ Level 4 Award in F-gas and ODS Regulations: Category I	F-gas Handling in Large RAC Systems plus Category II, III and IV awards* Award Code 5N0104
Category II	2079-12 City and Guilds NDAQ Ref No, 500/5731/3 NFQ Level 4 Award in F-gas and ODS Regulations: Category II	F-gas Handling in Small RAC Systems plus Category III and IV awards* Award Code 5N0103
Category III	2079-13 City and Guilds NDAF Ref No. 500/5732/7 NFQ Level 4 Award in F-gas and ODS Regulations: Category III	F-gas Recovery in Small RAC Systems plus Category IV award* Award Code 5N0105
Category IV	2079-14 City and Guilds NDAF Ref No. 500/5729/7 NFQ Level 4 Award in F-gas and ODS Regulations: Category IV	F-gas Refrigerant Leak Detection Award Code 5N0102

* Completion of all four minor awards leads to a Special Purpose Award in Handling F-gas Refrigerants.

Exemptions

Under the EC F-gas Regulation there are exemptions for three categories of personnel:

- 1) Trainees are exempt for up to 2 years, but they must work under the supervision of a person with an appropriate personnel certificate (including an interim certificate) and must be enrolled on a relevant training course.
- 2) Personnel only undertaking brazing, soldering or welding on a piece of RAC equipment are exempt if they hold a nationally recognised qualification to undertake such activities and if they are supervised by a person holding an appropriate personnel certificate (including an interim certificate) to undertake installation of F-gas containing equipment.
- 3) Personnel undertaking recovery of F-gases from "waste equipment" under the WEEE Directive (Waste Electrical and Electronic Equipment) EC 96/2002 with an F-gas charge less than 3 kg, in premises covered by an appropriate permit, are exempt provided that they are employed by the company holding the permit and have completed a training course on the minimum skills and knowledge corresponding to Category III that is verified by an attestation of competence issued by the permit holder.

See Commission Regulation (EC) No. 303/2008 for more details on these exemptions.

b. Ensure that companies contracted to provide qualified engineers hold company certification

The requirement for company certification arises out of the EC F-gas Regulation. Companies (including sole traders) undertaking refrigeration and air-conditioning work must hold a company certificate if they employ personnel who carry out installation and/or maintenance and servicing on stationary RAC systems containing or designed to contain HFCs. This obligation may also apply to in-house personnel of larger companies undertaking this work.

The detail of company certification requirements are set out in the supporting Commission Regulation (EC) No. 303/2008 as are the definitions of the categories of activities listed above.

If a company directly employs personnel to undertake such activities then the company must hold a company certificate and the personnel will be required to hold appropriate qualifications. If a company sub-contracts **all** of this type of work and only acts in a project management capacity (i.e. it does not directly employ any qualified staff to work on RAC equipment containing or designed to contain F-gases) then the company may not require a company certificate.

F-Gas Registration Ltd. is the certification company established in Ireland to issue company certificates. Certification can be completed online at www.fgasregistration.ie or by contacting F-Gas Registration Ltd. at

Unit 7, Northwest Business Park,
Blanchardstown,
Dublin 15 or

Tel: +353 (0)86 2089900 or
email info@fgasregistration.ie.

3.2 Containment

a. Undertake regular leak tests on all equipment containing 3 kg or more of an HFC/HCFC refrigerant and ensure that any leaks are repaired

Equipment containing HFC or HCFC refrigerant must be checked periodically for leakage. The leak checking has to be carried out by qualified personnel. Commission Regulation (EC) No. 1516/2007 requires that all newly installed equipment containing F-gases should be checked for leakage immediately after installation.

“*Checked for leakage*” means that the equipment or system is examined for leakage using direct or indirect measuring methods, focusing on those parts of the equipment or system most likely to leak. The frequency of testing depends on the refrigerant, the charge and system type.

The leak checking frequencies are summarised in Table 2.

All F-gas systems with a charge greater than 300kg must have an automatic leak detection system, which must be checked annually to ensure its proper functioning. Further guidance on leak checking is provided in the Commission Regulation (EC) No. 1516/2007.

Leak checking in practice

Commission Regulation (EC) No. 1516/2007 sets out details of leak checking requirements for F-gas refrigerants such as HFCs. There is no equivalent guidance for ODS refrigerants such as HCFCs. However, all leak checks should be carried out in accordance with Commission Regulation (EC) No. 1516/2007 as best practice, regardless of whether the refrigerant is HFC or HCFC. The qualified person undertaking the leak check needs to decide which is the most appropriate method or methods for the leak check – direct or indirect.

Table 3: Leak Testing Frequencies

Leak Testing Frequency	ODS		F-gases	
	System charge – normal	System charge – Hermetically sealed	System charge – normal	System charge – Hermetically Sealed
None	■ < 3 kg	■ < 6 kg	■ < 3 kg	■ < 6 kg
Annual	■ 3 kg to 30 kg	■ 6 kg to 30 kg	■ 3 kg to 30 kg ■ 30 kg to 300 kg where automatic leak detection in place	■ 6 kg to 30 kg ■ 30 kg to 300 kg where automatic leak detection in place
6-monthly	■ 30 kg to 300 kg	■ 30 kg to 300 kg	■ 30 kg to 300 kg ■ > 300kg where automatic leak detection in place	■ 30 kg to 300 kg ■ > 300kg where automatic leak detection in place
Quarterly	■ > 300 kg	■ > 300 kg	■ > 300 kg	■ > 300 kg

No matter which method is chosen the following parts of the equipment shall be systematically checked:

- Joints;
- Valves including stems;
- Seals, including seals on replaceable driers and filters;
- Parts of the system subject to vibration; and,
- Connections to safety or operational devices.

Direct Leak Checking

In all situations the leak test can include checks made with one or more of three “direct” measuring techniques:

- Portable gas detection devices;
- UV sensitive detection fluid or dye in the circuit; and,
- Soap suds or proprietary bubble solutions.

It is often best to use a combination of techniques e.g. an electronic detector to test a wide area and soap suds to identify the exact location of the leak.

Portable gas detection devices need to be checked every 12 months to ensure their proper functioning and must have a sensitivity of at least five grams per year.

Indirect Leak Checking

In some situations it is possible to use “indirect” leak measurement. This involves observation of parameters such as temperatures and pressures in the refrigeration system to ascertain whether there is a shortage of refrigerant. This can be especially useful if parts of the plant are inaccessible or located outdoors (when a hand held leak detector may not function). If a leak is suspected, it will often be necessary to use direct measurement methods to identify the exact location of the leak.

Indirect measuring methods can be applied in cases where the leakage develops very slowly and where the equipment is placed in a well ventilated environment making it difficult to detect F-gases escaping from the system into the air.

Leak Repair

If a leak is found it must be repaired by a qualified person. The repair must be retested for leakage within one month of the repair to ensure that the repair has been effective. In practice, the retest should ideally be done shortly after the repair is completed and the plant is back in service.

b. Fit automatic leak detection – for larger systems with 300 kg or more of an HFC refrigerant

Automatic leak detection is *“a calibrated mechanical, electrical or electronic device for detecting leakage which, on detection, alerts the operator”*. The detection system must be checked at least once a year to ensure proper functioning.

There is no mandatory requirement to fit automatic leak detection on HCFC systems.

For any plant fitted with an automatic leak detection system (including those below the mandatory 300 kg threshold), the frequency of leak checking can be halved. However, an annual check remains the minimum frequency.

Two different types of automatic leak detection system can be considered:

- **A direct system**, that uses electronic sensors to detect the presence of leaked refrigerant in areas adjacent to the refrigeration plant. This can be good if the detectors are located in the right

place, but would not usually be effective in an outdoor situation.

- **An indirect system**, which interprets appropriate measurements within the refrigeration plant to predict a leak. This might include liquid level in a receiver vessel combined with relevant temperatures and pressures.

Both systems have advantages and disadvantages and it depends on the location and operation of the system as to which method is most appropriate.

c. Keep records about each system containing F-gases and ODS

Records must be kept about each system containing 3 kg or more of HFC or HCFC refrigerant.

The records must include:

- The name, postal address and telephone number of the operator;
- The **quantity** and **type** of F-gas refrigerants installed in each system⁴;
- Any **quantities** of refrigerant **added**;
- The **quantity** of refrigerant **recovered** during servicing, maintenance and final disposal;
- The **identity** of the **company** or **personnel** who performed the servicing or maintenance, as well as the **dates** and **results** of leak checks and leakage detection system checks; and,
- Details of automatic leak detection systems, including results of annual checks for effectiveness.

⁴ This is a requirement of the F-gas Regulation only, but is advised in best practice also if ODS refrigerants are installed.

Records may be kept centrally or with the equipment; the main requirement is that they are accessible so they **can be made available** on request to the competent authority (the EPA) and to the Commission. In addition, the operator should be prepared for inspections by the competent authority and ideally should nominate a person who is responsible for producing records during inspection.

Before carrying out leak checks, certified personnel shall check the equipment records to determine any previous issues and consult previous reports.

The requirement to keep records is to improve containment of F-gases and ODS. Using the information that has been collected in your equipment records can allow you to monitor and reduce losses of F-gases and ODS and so maintain equipment and optimise energy efficiency, minimise downtime and identify poorly operating equipment.

See Appendix 4 for recommended record sheet.

3.3 Recovery and Waste Management

a. Ensure proper recovery of any refrigerant removed from your systems during maintenance or on decommissioning

If HFC/HCFC refrigerant needs to be removed from RAC equipment it must be properly recovered by suitably qualified technicians/engineers and all due care must be taken to minimise any emissions.

In practice, this can be done using a refrigerant recovery unit, which comprises of a small compressor, filters and controls. One side is connected to the refrigeration system via service valves and the other side to a purpose built designated recovery cylinder. Some recovery units have the capability to extract most of the refrigerant in liquid form, before switching to extract any remaining vapour.

Great care should be taken to label the recovery cylinder in order to identify its contents and not to mix different refrigerants. After recovery the refrigerant can be reused or sent for reclamation or destruction, see EPA guidance on ODS at www.ozone.ie.

What options are there for dealing with recovered refrigerant? After recovery the refrigerant can be reused, recycled or sent for reclamation or destruction:

- **Reuse.** In some situations refrigerant can be reused directly without any further processing. For example, some refrigerant might be removed during servicing and then directly refilled back into the same equipment.
- **Recycle.** In other situations it may be preferable to carry out some simple cleaning operations on the recovered refrigerant, for example to remove traces of oil and moisture. This can be carried out with portable recycling equipment at the end-user site.
- **Reclamation.** It may be necessary to thoroughly clean the old refrigerant of contaminants before it is reused. To clean the refrigerant it will need to be reclaimed. This is usually done by transporting the recovered gas to a major facility that is able to fully reprocess the old refrigerant and produce a refrigerant that is almost indistinguishable from virgin product.
- **Destruction.** Any waste refrigerant that cannot be reused, recycled or reclaimed must be destroyed. This is done by incineration in specialised facilities. In some cases, destruction may be more cost effective than reclamation through reprocessing. It is illegal to mix different refrigerants, under the Waste Management (Facility Permit and Registration) Regulations (S.I No. 821 of 2007).

b. Ensure that waste refrigerant is handled appropriately

Once a decision has been taken to discard refrigerant, it is classified as hazardous waste. Virgin HCFCs, which can no longer be used in the maintenance and servicing of RAC equipment, are considered a hazardous waste. Waste producers have a "duty of care" for the waste they handle and must ensure they use the right documentation and move waste appropriately.

The EPA has developed a position paper on the handling of waste F-gas and ODS refrigerants and it is important to be aware of its requirements. The position paper is available to download from www.ozone.ie.

Waste is defined in Section 4(1) of the Waste Management Act 1996 as amended, as *"any substance or object... which the holder discards or intends to discard or is required to discard, and anything which is discarded or otherwise dealt with as if it were waste shall be presumed to be waste until the contrary is proved"*. Under Section 32 of the Waste Management Act 1996, as amended, a holder of waste, *"shall not hold, transport, recover or dispose of waste in a manner that causes or is likely to cause environmental pollution"*. The Waste Management Act 1996, as amended, provides the basis for the management of hazardous waste in Ireland.

Transport of waste refrigerant gases

Questions and Answers in relation to some scenarios on the use and handling of waste refrigerants have been prepared by the EPA and are given in Appendix 6.

The collection and transport of waste refrigerant gases can only be carried out by a person that either holds an appropriate waste collection permit or has submitted a Prior Annual Notification to the EPA. Waste refrigerant gases must be brought to an appropriately authorised waste facility when taken from an end-user site. The following options apply for the movement and management of waste refrigerant gases:

1. The holder of an appropriate waste collection permit can collect and transport waste refrigerant gases from an RAC contractor or end user and transfer the waste refrigerant gases to an appropriately authorised facility. C1 forms for the movement of hazardous waste within Ireland, under a waste collection permit, will be required and any transfer of hazardous waste outside the State must be in accordance with the requirements of transfrontier shipment of waste (TFS requirements).
2. A contractor who has made a **Prior Annual Notification** to the EPA can transport the waste refrigerant gas from the end-user site to an authorised waste management facility, as outlined in their Prior Annual Notification and in accordance with Article 30 of the Waste Management (Collection Permit) Regulations 2007 (S.I. No. 820 of 2007). In this instance, the contractor becomes the holder of the waste and must fulfil the general duty on the holder of waste set out in Section 32 of the Waste Management Act, as amended. A list of Prior Annual Notifications received and accepted by the EPA is available on www.ozone.ie. C1 forms are not required for the movement of waste refrigerant gases within Ireland, under a Prior Annual Notification. However, any transfer of hazardous waste outside the State must be in accordance with the requirements of transfrontier shipment of waste (TFS requirements).

3. The end user/operator can make its own arrangements for the proper management of the waste refrigerant. In this instance, the end-user remains the holder of the waste and must fulfil the general duty on the holder of waste set out in Section 32 of the Waste Management Act, as amended.

Storage of waste refrigerant gases

The storage of waste refrigerant gases is not permitted on any site (other than temporary storage at the site of generation), unless that site is specifically authorised to do so.

Appropriate authorisation will be one of the following:

1. Waste Licence issued by the EPA;
2. Waste Facility Permit issued by the relevant local authority; or,
3. Certificate of Registration issued by the relevant local authority.

Under no circumstances can a contractor store the waste refrigerant gas on their own site without having an appropriate authorisation for the storage of such waste.

c. Waste Electrical and Electronic Equipment (WEEE) Waste Management Issues

When RAC equipment reaches the end of its life it must be disposed of in an environmentally sound manner through a facility authorised to accept and/or treat Waste Electrical and Electronic Equipment (WEEE). The route by which the RAC equipment (WEEE) can be managed will vary, depending on when the unit was placed on the market, and

whether or not it is being replaced. The following points should be noted:

- For equipment placed on the market prior to 13 August 2005 that is now waste, the producer⁵ is obliged to take back WEEE of a similar type and function (irrespective of brand) when a business end-user is purchasing new equipment from him/her. **The producer is then responsible for the environmentally sound management of the WEEE.**
- If the business end user is simply discarding the WEEE (where the unit was placed on the market originally prior to 13 August 2005) and not replacing it, the responsibility for ensuring the environmentally sound management of the WEEE remains with the business end user.

An appropriately authorised waste management operator must be used to transport and manage the waste in both scenarios.

- For equipment placed on the market after August 2005 that will become waste, the producer must take back and manage WEEE from the business end-user or make alternative financing arrangements with the business user i.e. there must be a formal agreement between both parties on how and who will finance the management of the WEEE. The WEEE must be transported and managed by appropriately authorised waste management operators. **This requirement applies whether or not the equipment is being replaced.**

⁵ The producer is normally the person who placed the equipment on the market in Ireland for the first time.

If your company has purchased RAC units from outside the State or sourced them from an unregistered producer, your company will be required to register⁶ as a producer of Electrical and Electronic Equipment (EEE). To find out more about the requirements of the Waste Management (Waste Electrical and Electronic Equipment) Regulations 2005 including any producer obligations that may apply visit www.weee-enforcement.ie.

In addition, if the equipment contains batteries you will need to consider your obligations under the Waste Management (Batteries and Accumulators) Regulations 2008. More information is available at www.batteries-enforcement.ie.

3.4 Labelling

Make sure equipment installed since April 2008 is labelled

All new equipment containing F-gas refrigerant and F-gas blown foam must be labelled, irrespective of size. The labelling rule applies to RAC equipment and equipment containing foam placed on the market after 1 April 2008. Commission Regulation (EC) No. 1494/2007 sets out the labelling requirements for products and equipment containing F-gases.

Existing equipment does not need to be labelled, although it is good practice to label all equipment.

The label must include:

- The text 'Contains fluorinated greenhouse gases covered by the Kyoto Protocol';
- For equipment containing F-gas blown foam, the text 'Foam blown with fluorinated greenhouse gases'.
- The abbreviated chemical names for the F-gases contained or designed to be contained in the equipment using accepted industry nomenclature standard to the equipment or substance;
- The quantity of the F-gases, expressed in kilograms; and
- The text 'hermetically sealed' where applicable.

The label may be placed in any of the following positions

- adjacent to the service points for charging or recovering the F-gas;
- on that part of the product or equipment which contains the F-gas; or
- on, or adjacent to existing nameplates or product information labels.

3.5 Placing on the Market

Refillable containers

The use of non-refillable containers for transporting or storing F-gas refrigerants is banned. Placing on the market of non-refillable containers used to service equipment was banned from July 2007, except for those shown to be manufactured (i.e. filled with refrigerant) before 4 July 2007. Similarly, ODS refrigerants cannot be placed on the market in non-refillable containers.

⁶ All details on the registration process and a list of registered producers are presented on the website of the WEEE Register Society Ltd. www.weee-register.ie.

3.6 HCFC (including R22) Phase Out

Ensure you are prepared for the phase out of HCFCs

The use of HCFC in maintenance and servicing of RAC equipment is being phased out under Regulation (EC) No. 1005/2009, which came into force on 1 January 2010⁷. The most harmful ozone-depleting substances (e.g. CFCs such as R12) were banned in the 1990s. The installation of new equipment using less harmful “transitional” HCFC refrigerants such as R22 was banned in 2001 (or 2004 for small air-conditioning systems).

The two key phase-out dates for HCFCs are:

- **From 1 January 2010** it is illegal to use virgin HCFCs to service RAC equipment. This ban applies even if HCFC was purchased before the ban date. It is illegal to use any supplies of virgin HCFCs that were stockpiled before the end of 2009. Such stockpiles are considered hazardous waste.
- **From 1 January 2015** it will be illegal to use recycled or reclaimed HCFCs to service RAC equipment.

It should be noted that supplies of recycled or reclaimed HCFCs during the period 2010 to 2015 may be very limited and very expensive.

Regulation (EC) No. 1005/2009 has provided clarity on how the reclaimed and recycled HCFCs can be used until the complete ban on the use of HCFCs enters into force, as follows:

- **Recycled HCFCs** may be used for the maintenance or servicing of existing refrigeration, air-conditioning and heat pump equipment, provided that they have been recovered from such equipment and may only be used by the undertaking (contractor) which carried out the recovery as part of maintenance or servicing or by the undertaking (operator/end-user) for which the recovery was carried out as part of maintenance or servicing.
- **Reclaimed HCFCs** may be placed on the market and used for the maintenance or servicing of existing refrigeration, air-conditioning and heat pump equipment, provided that the container is labelled with an indication that the substance has been reclaimed and with information on the batch number and name and address of the reclamation facility.

Ban on virgin HCFCs

The ban on the use of virgin HCFC gases represents a significant issue if operators use HCFCs such as R22 or R408A in refrigeration or air-conditioning systems. R22 remains one of the most commonly used refrigerants and may be found in shop-floor refrigeration systems or in cold store and many types of building air-conditioning.

It should be noted that the bans described above refer to the “use” of HCFCs. This specifically means use for servicing and maintenance. It will remain legal to continue using RAC equipment containing HCFCs beyond the phase-out dates providing they do not require maintenance that involves putting any HCFCs back into a system.

⁷ The phase-out dates for HCFC in servicing and maintenance of RAC equipment were originally set out in the earlier Regulation (EC) No. 2037/2000 on substances that deplete the ozone layer.

Given that most refrigeration systems leak to a certain degree, all current users of HCFC systems must develop a plan to manage their operations in a manner that complies with the ban on virgin HCFC. The best option for dealing with the phase out depends on the age and efficiency of existing equipment. If the plant is old, unreliable or inefficient it may be best to consider replacement. If the equipment still has some years of useful life then it may be possible to retrofit with a “drop-in” replacement refrigerant.

The 3 main options for the operator are to:

- 1) **Replace the whole plant with a new system.**
This is the most expensive option, but enables the operator to minimise leakage and maximise energy efficiency.
- 2) **Change the refrigerant to a suitable alternative.** This is much cheaper than new equipment, but the operator will still have to make additional investment to ensure leakage is minimised and reliability and efficiency maximised.
- 3) Delay a decision until nearer the 2014 final phase-out date. This is initially the easiest option, but it may be a high risk strategy for the operator, as recycled and reclaimed HCFCs are likely to be in short supply between 2010 and 2015.

Contractors should be in a position to offer the best advice to operators to ensure that they are fully informed of their obligations and are in a secure position with regard to the continuity of critical equipment.

4. Where to Begin



As a contractor employed to service and maintain RAC equipment your client may need some help with meeting their obligations under these regulations.

The EPA recommends that each operator undertake the actions listed below. Although responsibility lies with the operator, a contractor may undertake some or all of this work on their behalf.

4.1 Consider if refrigerants are within the scope of the F-gas and ODS Regulations

Appendix 3 contains a listing of refrigerants controlled by the F-gas and ODS Regulations. While most commercially installed refrigerants are within the scope of the regulations some are not. These include systems using carbon dioxide (CO₂) as a refrigerant. Other out-of-scope refrigerants are:

- HC 290 – Propane
- HC 600a – Iso-butane
- R 717 – Ammonia

4.2 Consider if they are the operator of the equipment

Each end user should consider if they, or the contractors working on their behalf, are the operators of the RAC equipment. Where the contractor is deemed to be the operator, this should be formally and contractually agreed, as the operator is legally responsible for many of the requirements of the F-gas Regulation.

4.3 Develop an inventory of RAC equipment

All operators should create an inventory of the F-gas and ODS equipment at their premises (see Appendix 5 for an example of an inventory). The inventory should give each piece of equipment a unique identification and record the location and other relevant details (e.g. cross reference with their asset register). In addition the inventory should record the type of refrigerants within its systems and the quantity of refrigerant in each piece of equipment.

a. How to check which refrigerant is in the system

The first thing to do when determining which refrigerant is in the system is to check the label on the equipment. RAC equipment containing F-gases, placed on the EU market since 1 April 2008, must have a label with the text “Contains fluorinated greenhouse gases covered by the Kyoto Protocol” and must also indicate the type and amount of the F-gas.

If the label does not provide the necessary information then check the manual or the technical specifications of the equipment as these could provide information on the type of the refrigerant contained in the equipment. Alternatively, the supplier, manufacturer or company and engineer carrying out maintenance or servicing of this equipment may be able to provide this information.

Apart from pure substances, various blends (f-gas preparations) containing F-gases are in use, some of which may be covered by the Regulation. Under the F-gas Regulation, blends are defined as mixtures of two or more substances, of which at least one is an F-gas, except where the total global warming potential is less than 150. See Appendix 3 for a list of the more common blends. If the refrigerant is not on the list then check material safety data sheets or ask your refrigerant supplier.

In terms of HCFCs, R22 is the main refrigerant although some blends are still in use. Check Appendix 3 and follow the steps above to identify whether your equipment contains HCFCs.

b. How to establish the quantity of refrigerant in each piece of equipment

If you have established that an F-gas or ODS refrigerant is being used in RAC equipment, the next step is to find out how much refrigerant is in the system. This is important as it affects the way that the regulations will be applied.

If the system is labelled as hermetically sealed this should also be noted to the inventory as it will affect the leak checking frequency and record keeping requirements.

The initial options for establishing the refrigerant fluid charge of a system are as follows:

- The refrigerant charge might be shown on a label attached to the system;
- The charge might be recorded in the instruction manual or in commissioning records; and,
- It might be possible to get details from the plant manufacturer or the installation contractor.

If these options are not appropriate, it will be necessary to get an appropriately qualified person to examine the equipment in more detail to calculate the amount of refrigerant in the system.

5. Good Practice

5.1 Reducing Leakage

Emissions of F-gases and ODS are harmful to the environment and are costly to operators. Contractors and operators should seek to minimise all leaks from RAC systems. To achieve the lowest possible loss of refrigerant, an operator should consider taking the following steps:

- Only purchase equipment that is “leak tight”. This also involves making sure contractors are building leak-free systems from design through to installation. When installing both off-the-shelf and bespoke equipment, care is needed to build leak-free systems. Leaking systems cost money for the operator.
- Do regular leak checks and take action to repair leaks. By doing leak checks at least as often as required by the legislation you can build up a picture of which equipment leaks the most and be in a position to address the issues.
- Focus attention on the equipment with the most leak problems. It is typical to find that 80% of annual leakage comes from only 20% of the refrigeration systems. By expending more effort on identifying and maintaining these systems you can minimise your leaks.
- Ensure that complete records are maintained. Records are the source of the data that can help to manage and reduce refrigerant leakage.

By following these suggestions the likelihood of refrigerant loss can be reduced.

5.2 Considering Alternatives

One way of reducing F-gas or ODS emissions is to use an alternative refrigerant. These include, for example, natural refrigerants, such as CO₂, ammonia, hydrocarbons or low global warming potential refrigerants. However, before you invest you should take care that the alternative design is cost effective and has the lowest “overall carbon footprint⁸”. Refrigeration equipment gives rise to two main types of greenhouse gas emissions:

- Direct emissions of refrigerants such as F-gases through leakage; and,
- Indirect emissions of CO₂ from the power station supplying the plant with electricity.

For most refrigeration plants it is the energy related CO₂ emission that is the dominant part of the overall carbon footprint. Hence, it is essential that a system with an alternative refrigerant is equal to or better than an HFC/HCFC system in terms of energy efficiency.

5.3 Energy Efficiency

The operation of RAC equipment accounts for a significant percentage of the total energy costs. The steps necessary for compliance with the F-gas and ODS Regulations provide an opportunity to assess the energy efficiency of your RAC equipment. If HCFC systems have to be replaced or retrofitted, this is particularly important.

⁸ A measure of the impact our activities have on the environment, especially climate change, often reported as the units of tonnes (or kg) of carbon dioxide each of us produces over a given period of time.

Typical issues to consider are:

- Load reduction (e.g. better time and temperature controls);
- Plant operating conditions (e.g. reduce head pressures);
- Secondary loads (e.g. chilled water pumps);
- Part-load operation (e.g. compressor controls and variable speed drives).

It is important that contractors consider the optimum charge for a system to minimise the overall carbon footprint of the piece of equipment. Systems with low levels of refrigerant may continue to operate but will use more energy to achieve their function than equipment that has an appropriate level of refrigerant charge.

Appendices

Appendix 1: Abbreviations and Definitions

Term	Abbreviation	Definition
Fluorinated greenhouse gases	F-gas	Means hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF ₆) or preparations containing these gases, unless controlled by the ODS Regulation. <i>From EC F-gas Regulation 842/2006</i>
Ozone depleting substance	ODS	Various chemicals, including CFCs and HCFCs that damage the ozone layer. Many are already completely phased out.
Chlorofluorocarbon	CFC	Family of chemicals that was historically used in various applications such as refrigeration, foam blowing and aerosols. Now completely banned under ODS Regulation.
Hydrochloro-fluorocarbon	HCFC	Family of chemicals used in various applications such as refrigeration, foam blowing and aerosols. Already phased out in many applications under ODS Regulation. All maintenance applications will be banned in EU by 2015.
Hydrofluorocarbon	HFC	Means an organic compound consisting of carbon, hydrogen and fluorine, and where no more than six carbon atoms are contained in the molecule. <i>From EC F-gas Regulation 842/2006</i>
Perfluorocarbon	PFC	Family of F-gas chemicals used in unusual applications such as electronic chip manufacture, as refrigerants and in older fire protection systems.
Hydrocarbon	HC	Family of chemicals including propane and butane. These have been adopted as alternatives to ODS and F-gases in some applications.
Preparation		Means for the purposes of the obligations in the EC F-gas Regulation, excluding destruction, a mixture composed of two or more substances at least one of which is a fluorinated greenhouse gas, except where the total GWP of the preparation is less than 150. The total GWP of the preparation shall be determined in accordance with EC F-gas Regulations Part 2 of Annex I. <i>From EC F-gas Regulation 842/2006</i>
Global warming potential	GWP	Means the climatic warming potential of a fluorinated greenhouse gas relative to that of carbon dioxide (CO ₂ has a GWP = 1). The GWP is calculated in terms of the 100-year warming potential of one kilogram of a gas relative to one kilogram of CO ₂ . <i>From EC F-gas Regulation 842/2006</i>
Carbon footprint		A measure of the impact our activities have on the environment, especially climate change, often reported as the units of tonnes (or kg) of carbon dioxide each of us produces over a given period of time.

Term	Abbreviation	Definition
Heat pump		Means a device or installation that extracts heat at low temperature from air, water or earth and supplies heat. From EC F-gas Regulation 842/2006
Hermetically sealed system		Means a system in which all refrigerant containing parts are made tight by welding, brazing or a similar permanent connection which may include capped valves and capped service ports that allow proper repair or disposal and which have a tested leakage rate of less than 3 grams per year under a pressure of at least a quarter of the maximum allowable pressure. <i>From EC F-gas Regulation 842/2006</i>
Operator		Means the natural or legal person exercising actual power over the technical functioning of the equipment and systems covered by this Regulation; a Member State may, in defined, specific situations, designate the owner as being responsible for the operator's obligations. <i>From EC F-gas Regulation 842/2006</i>
Leak detection system		Means a calibrated mechanical, electrical or electronic device for detecting leakage of fluorinated greenhouse gases which, on detection, alerts the operator. <i>From EC F-gas Regulation 842/2006</i>
Recovery		Means the collection and storage of fluorinated greenhouse gases/ozone depleting substances from, for example, machinery, equipment and containers during maintenance or servicing or before disposal. <i>From EC F-gas Regulation 842/2006 and EC Ozone Regulation 1005/2009</i>
Recycling		Means the reuse of a recovered fluorinated greenhouse gas/ozone depleting substances following a basic cleaning process. <i>From EC F-gas Regulation 842/2006 and EC Ozone Regulation 1005/2009</i>
Reclamation		Means the reprocessing of a recovered controlled substance in order to meet the equivalent performance of a virgin substance, taking into account its intended use. <i>From EC F-gas Regulation 842/2006 and EC Ozone Regulation 1005/2009</i>
Destruction		Means the process by which all or most of a fluorinated greenhouse gas is permanently transformed or decomposed into one or more stable substances which are not fluorinated greenhouse gases. <i>From EC F-gas Regulation 842/2006</i>

Term	Abbreviation	Definition
Non-refillable container		<p>Means a container that is designed not to be refilled and is used in the servicing, maintenance or filling of refrigeration, air-conditioning or heat pump equipment, fire protection systems or high-voltage switchgear, or to store or transport fluorinated greenhouse gas based solvents.</p> <p><i>From EC F-gas Regulation 842/2006</i></p>
Installation		<p>Means joining two or more pieces of equipment or circuits containing or designed to contain fluorinated greenhouse gas refrigerant, with a view to assembling a system in the location where it will be operated, including the action by which refrigerant conductors of a system are joined together to complete a refrigerant circuit irrespective of the need to charge the system after assembly.</p> <p><i>EC Minimum qualifications for stationary RAC equipment 303/2008</i></p>
Maintenance or servicing		<p>Means all activities, excluding recovery and checks for leakage, which entail breaking into the circuits containing or designed to contain fluorinated greenhouse gases, in particular supplying the system with fluorinated greenhouse gases, removing one or more pieces of circuit or equipment, re-assembling two or more pieces of circuit or equipment, as well as repairing leakages.</p> <p><i>EC Minimum qualifications for stationary RAC equipment 303/2008</i></p>
Use		<p>Means the utilisation of fluorinated greenhouse gases in the production, refilling, servicing or maintenance of products and equipment covered by this Regulation.</p> <p><i>From EC F-gas Regulation 842/2006</i></p>

Appendix 2: Sources of Further Information

There are a number of sources of additional information on the EC F-gas and ODS Regulations that is most easily accessed from the internet.

To download copies of the legislation

For copies of relevant Irish regulations see link below and for access to the European Regulations select EU Regulation at the same link.

Please see: www.environ.ie/en/Legislation/Environment/Atmosphere/

Environmental Protection Agency

Guidance and policy documents on both the EC F-gas and ODS Regulations as well as the management of hazardous waste are available to download from the EPA website: www.epa.ie.

For more specific guidance please see: www.ozone.ie and www.fgases.ie

European Commission Guidance

The European Commission has produced some guidance for all sectors on the EC F-gas Regulations. For the RAC sector there are two sets of guidance one for operators and one for technical personnel. There is also a section on the ODS Regulation.

For F-gases see: http://ec.europa.eu/environment/climat/fluor/publications_en.htm

For ODS see: <http://ec.europa.eu/environment/ozone/>

From here you can also get an introduction to the legislation and find links to the regulations by selecting the appropriate buttons on the left hand side menu.

FETAC

The Further Education and Training Awards Council in Ireland (FETAC) have developed national standards equivalent to the City and Guilds F-gas qualifications that have been developed in the UK. These courses have been assessed as Level 5 FETAC Award courses and the FETAC course developed for the refrigeration and air conditioning sector is the Special Purpose Certificate in Handling F-gas Refrigerants 5S0108.

For more information on FETAC courses see: www.fetac.ie

Refrigeration Skillnet

Refrigeration Skillnet is an industry-led training network for companies in the refrigeration and air-conditioning (RAC) sector in Ireland. They can provide details of F-gas training and other courses that are being delivered in Ireland.

For more details see: www.refrigerationskillnet.ie

Appendix 3: Refrigerants Affected by these Regulations

The following tables list the F-gas and ODS refrigerants by type, which regulation will govern its use; the first table is for pure refrigerants and indicates the main markets where they tend to be used, the second table is for blends used for RAC purposes.

Table 4: Pure Refrigerants

Refrigerants	Formula	EC F-gas Regulation?	EC ODS Regulation?	Main Markets
HCFC 22 (R22)	CHClF ₂	x	✓	RAC
HCFC 123 (R123)	CHCl ₂ CF ₃	x	✓	RAC
HCFC 124 (R124)	C ₂ HClF ₄	x	✓	Blend component
HCFC 142b (R142b)	C ₂ H ₃ ClF ₂	x	✓	Solvent
HFC 23 (R23)	CHF ₃	✓	x	Fire protection, electronics manufacture
HFC 32 (R32)	CH ₂ F ₂	✓	x	Blend component
HFC 41 (R41)	CH ₃ F	✓	x	
HFC 43-10mee (R43-10mee)	C ₅ H ₂ F ₁₀	✓	x	Solvent
HFC 125 (R125)	C ₂ HF ₅	✓	x	Blend component. Fire protection
HFC 134 (R134)	C ₂ H ₂ F ₄	✓	x	
HFC 134a (R134a)	CH ₂ FCF ₃	✓	x	RAC, aerosols, foam
HFC 143 (R143)	C ₂ H ₃ F ₃	✓	x	
HFC 143a (R143a)	C ₂ H ₃ F ₃	✓	x	Blend component
HFC 152a (R152a)	C ₂ H ₄ F ₂	✓	x	Blend component
HFC 227ea (R227ea)	C ₃ HF ₇	✓	x	Fire protection, aerosols
HFC 236cb (R236cb)	CH ₂ FCF ₂ CF ₃	✓	x	
HFC 236ea (R236ea)	CHF ₂ CHFCF ₃	✓	x	
HFC 236fa (R236fa)	C ₃ H ₂ F ₆	✓	x	Some use in Portable Fire Extinguishers
HFC 245ca (R245ca)	C ₃ H ₃ F ₅	✓	x	
HFC 245fa (R245fa)	CHF ₂ CH ₂ CF ₃	✓	x	Foam blowing
HFC 365mfc (R365 mfc)	CF ₃ CH ₂ CF ₂ CH ₃	✓	x	Foam blowing, solvent
HC 290 – Propane	C ₃ H ₈	x	x	RAC
HC 600a – Iso-butane	C ₄ H ₁₀	x	x	RAC
R 717 – Ammonia	NH ₃	x	x	RAC

Table 5: Blended Refrigerants Used in RAC Market

Refrigerant	Composition Variants*	Composition Components	Type	EC F-gas Regulation?	EC ODS Regulation?
R401	A, B, C	R22/152a/124	HCFC + HFC	✓	✓
R402	A, B	R22/125/290	HCFC + HFC + HC	✓	✓
R403	A, B	R22/218/290	HCFC + PFC + HC	✓	✓
R404	A	R143a/125/134a	HFC	✓	✗
R406	A	R22/600a/142b	HCFC + HC	✗	✓
R407	A, B, C	R32/125/134a	HFC	✓	✗
R408	A	R22/143a/125	HCFC + HFC	✓	✓
R409	A, B	R22/142b/124	HCFC	✗	✓
R410	A	R32/125	HFC	✓	✗
R411	B	R22/152a/1270	HCFC + HFC + HC	✓	✓
R413	A	R134a/218/600a	HFC + PFC + HC	✓	✗
R416	A		HFC	✓	✗
R417	A	R125/134a/600	HFC + HC	✓	✗
R422	A, D	R125/134a/600a	HFC + HC	✓	✗
R423	A	R134a/227	HFC	✓	✗
R424	A	R134a/125/600/600a/601a	HFC + HC	✓	✗
R427	A	R134a/125/32/143a	HFC	✓	✗
R428	A	R125/143a/600a/290	HFC + HC	✓	✗
R434	A	R125/143a/R134a/600a	HFC + HC	✓	✗
R507		R143a/125	HFC (azeotropic)	✓	✗
R508		R23/116	HFC + PFC (azeotropic)	✓	✗

* Composition Variant: Each blend in the table above contains 2 or 3 components. For example R401 contains a mixture of R22, R152a and R124. R401 is available in three different composition variants as follows:

- R401A is 53% R22, 13% R152a and 34% R124
- R401B is 61% R22, 11% R152a and 28% R124
- R401C is 33% R22, 15% R152a and 52% R124

These different compositions are chosen by the refrigerant manufacturers to provide performance characteristics to suit different RAC applications.

Symbols and abbreviations used in the tables

- | | | | |
|------|-------------------------|-----|--------------------------|
| ✗ | Not relevant | ✓ | Relevant and must comply |
| HCFC | Hydrochlorofluorocarbon | HFC | Hydrofluorocarbon |
| PFC | Perfluorocarbon | HC | Hydrocarbon |

Appendix 4: Sample Log Sheet for Record Keeping

The table below shows an example Equipment Record sheet for compliance with the EC F-gas Regulation. Records of this type must be kept for **each** RAC system that contains 3 kg or more of HFC refrigerant and for **each** RAC system that contains 3 kg or more of HCFC. A Waste Management Record sheet is also presented.

Equipment Record				
<i>Name of Equipment Operator</i>				
<i>Postal Address</i>				
<i>Telephone Number</i>				
<i>Equipment Model</i>		<i>Unique Identifier</i>		
<i>Description</i>		<i>Hermetically Sealed</i>		<i>Yes / No</i>
<i>Location of plant</i>		<i>Date of Installation</i>		
<i>Refrigerant Type</i>		<i>Refrigerant Quantity/Charge (kg)</i>		
Refrigerant Additions				
<i>Date</i>	<i>Personnell/Company*</i>	<i>Type of Refrigerant</i>	<i>Amount Added, kg</i>	<i>Reason for addition</i>
Refrigerant Removals				
<i>Date</i>	<i>Personnell/Company*</i>	<i>Type of Refrigerant</i>	<i>Amount Removed (kg)</i>	<i>Reason for removal</i>
Leak Tests (including follow-up tests)				
<i>Date</i>	<i>Personnell/Company*</i>	<i>Areas Checked</i>	<i>Test Result (location and cause of any leaks identified)</i>	<i>Follow up actions and checks required</i>
Maintenance or Servicing Activities				
<i>Date</i>	<i>Personnell/Company*</i>	<i>Areas concerned</i>	<i>Maintenance/ servicing work</i>	<i>Comments</i>
Testing of Automatic Leak Detection System (if fitted)				
<i>Date</i>	<i>Personnell/Company*</i>	<i>Test Result</i>	<i>Comments</i>	
Other relevant information				

* include name of engineer and of company, postal address, telephone number.

Appendix 5: Example Inventory

The table below shows an example inventory and suggestions for other information that could be captured in the inventory. Keeping an inventory is not a mandatory requirement of the EC F-gas or ODS Regulations. However, an inventory is considered good practice as it can provide a summary of all the equipment on site and can be used as a means of tracking equipment and collating relevant information in relation to both these regulations.

Equipment/ system unique identifier	Equipment Location	Type of Refrigerant	Quantity of Refrigerant (kg)	Leak Checking Requirement	Contractors Responsible	Next Service
RSZ60	Roof 1	R 410A	12kg	1 x year	Xx Freeze Ltd	Feb 2010
Other points to include: <ul style="list-style-type: none"> ■ Links to asset register ■ Serial number of equipment 	Other points to include: <ul style="list-style-type: none"> ■ Reference to site plan ■ Unit description 	Other points to include: <ul style="list-style-type: none"> ■ Which Regulation is relevant ■ Is HCFC phase out relevant 	Other points to include: <ul style="list-style-type: none"> ■ How has this been determined? From actual data from installation contractors, design documents or calculation. 	Other points to include: <ul style="list-style-type: none"> ■ Is the system hermetically sealed? 	Other points to include: <ul style="list-style-type: none"> ■ Where are the records kept ■ Date of last service ■ Relevant company certification reference and date of expiry ■ Details of qualified employees 	

Appendix 6: Questions and Answers regarding the Management of Waste Refrigerant

Both the end-users and the RAC contractors may encounter a number of scenarios when equipment containing refrigerant gases is being serviced or decommissioned. These scenarios are addressed in the questions and answers presented below from an end-user's perspective.

Questions and answers for CONTRACTORS using Refrigerant Gases

1. Question – What qualifications should I have for handling refrigerants?

Answer – You should currently hold City and Guilds Certificate in Handling Refrigerants Scheme 2078. In addition, you should be making plans to become qualified to City and Guilds (Level 2 Award in F-gas Regulation, No. 2079) standard **or** FETAC Level 5 (Specific Purpose Certificate in Handling F-gas Refrigerants 5S0108) standard, by 4 July 2011. Further information on training courses is available from Refrigeration Skillnet (www.refrigerationskillnet.ie).

2. Question – Can I recover R22 from a system and charge with virgin gas before 31 December 2009, and keep the recovered gas for use from 1 January 2010?

Answer – No. The European Commission has confirmed that such a practice is not in keeping with Regulation 2037/2000 on ozone depleting substances. The EPA does not consider the complete exchange of usable HCFC with virgin R22 a maintenance or servicing operation.

3. Question – Can I recover refrigerant gas from a system on my client's site, service the system, and return the gas to the same system on that site?

Answer – Yes, the refrigerant gas is not being discarded and is therefore not a waste. If the gas has undergone a basic cleaning process, it is considered recycled.

4. Question – I have recovered R22 from a system on my client's site. Can I use it for maintenance or servicing of other equipment on that same site?

Answer – Yes, the recovered R22 should be recycled on-site and can then, with the end-user's permission, be used for maintenance or servicing of other equipment on that site.

5. Question – Can I recover refrigerant gas from a system on my client's site and charge the system with a different type of gas?

Answer – Yes, but what you do or the end-user does with the recovered gas must comply with the waste legislation and the requirements set out in the ODS Regulations.

6. Question – My client has a critical system running on R22 and I am worried that recycled or reclaimed R22 might be in short supply after 31 December 2009. Can I recover the R22 from the system and replace with virgin R22 before 31 December 2009 and keep the recovered gas for future maintenance or servicing needs?

Answer – No. The European Commission has confirmed that such a practice is not in keeping with Regulation 2037/2000 on ozone depleting substances, or the Recast (Regulation (EC) No. 1005/2009). The EPA does not consider the complete exchange of usable HCFC with virgin R22 a maintenance or servicing operation.

7. Question – I have recovered R22 from a system on my client’s site and I have no use for it. Can I leave it on my client’s site for him to deal with?

Answer – Yes, but you should advise your client that they must ensure that the recovered gas is managed properly and that there must be a reasonable certainty that the quantities retained will be used. If, in the opinion of the EPA, a reasonable certainty of use cannot be demonstrated for the quantity of recovered R22 being retained, the EPA reserves the right to direct the end-user to discard such quantities of recovered refrigerant as hazardous waste. Purpose-built recovery designated cylinders should be used for the recovered gas.

8. Question – I have recovered R22 from a system on my client’s site. Can I take it away for my use on another client’s site?

Answer – Yes, as long as the recovered gas is recycled, you can use it in equipment on which you are carrying out maintenance or servicing. You are required to maintain records of the source of any recovered gas that you remove from a site and have used on another end-user’s site.

9. Question – I have recovered R22 from a system on my client’s site and I have no further use for the gas. Can I give/sell the recovered gas to another contractor who I know needs it?

Answer – No, recycled HCFC can only be used by your client on that site or any other site within their organisation, or by you on that site or another site on which you are carrying out maintenance or servicing. This means that the recovered gas cannot be given/sold by you or your client to any other contractor for maintenance or servicing on an unrelated site.

10. Question – My client has 5 separate R22 chillers onsite and we have agreed an 18-month plan for their decommissioning. Can I leave some recovered gas onsite until the final system is decommissioned?

Answer – Yes, but with the following provisos:

- a. The recovered R22 should be recycled onsite using a basic cleaning process;
- b. Your client must ensure that the retention of recycled R22 onsite is reported to the EPA;
- c. The quantity of R22 retained onsite should be in proportion to the demonstrated need for recycled R22, vis-à-vis the chillers remaining in use onsite i.e. there should be reasonable certainty regarding the future use of the recovered R22 to be retained;
- d. Your client and you should maintain relevant records regarding the quantities of R22 recovered, recycled and reused onsite;
- e. Recovered R22, for which there is no further demonstrated need, must be managed as a hazardous waste; and,
- f. No R22 must be used in maintenance or servicing after 31 December 2014.

11. Question – If I use recycled or reclaimed HCFCs during maintenance or servicing, do I need to use any special labels?

Answer – Yes, any equipment that is maintained or serviced using recycled or reclaimed HCFCs must be labelled detailing the type of substance and its quantity contained in the equipment.

12. Question – Am I required to keep any particular records of recycled or reclaimed HCFCs used during maintenance or servicing?

Answer – Yes, any undertaking (contractor or end-user) using recycled or reclaimed HCFCs during maintenance or servicing must keep a record of the supplier of reclaimed HCFCs and of the source of the recycled HCFCs. Such records should be available for inspection by the EPA.

13. Question – What is a purpose built designated recovery cylinder?

Answer – A purpose built designated recovery cylinder is one which can be obtained from a refrigerant gas wholesaler and should be approved for use with the type of refrigerant to be recovered. It should be checked to ensure its integrity and fitness to use prior to connection. It should have indelible marking to clearly differentiate it from stock refrigerant containers and should be labelled to indicate the refrigerant, the type of oil, any possible contamination, the weight of the cylinder and the quantity of refrigerant contained.

14. Question – What happens when I submit a Prior Annual Notification?

Answer – The EPA will assess the details provided in your Prior Annual Notification (PAN) and, where acceptable, will issue an acknowledgement, as provided for by the legislation. A list of those contractors who have made PAN for which an acknowledgement has been given, will be listed on the EPA website at www.ozone.ie.

An Ghníomhaireacht um Chaomhnú Comhshaoil

Is í an Ghníomhaireacht um Chaomhnú Comhshaoil (EPA) comhlachta reachtúil a chosnaíonn an comhshaoil do mhuintir na tíre go léir. Rialaímid agus déanaímid maoirsiú ar ghníomhaíochtaí a d'fhéadfadh truailliú a chruthú murach sin. Cinntímid go bhfuil eolas cruinn ann ar threochtaí comhshaoil ionas go nglactar aon chéim is gá. Is iad na príomh-nithe a bhfuilimid gníomhach leo ná comhshaoil na hÉireann a chosaint agus cinntiú go bhfuil forbairt inbhuanaithe.

Is comhlacht poiblí neamhspleách í an Ghníomhaireacht um Chaomhnú Comhshaoil (EPA) a bunaíodh i mí Iúil 1993 faoin Acht fán nGníomhaireacht um Chaomhnú Comhshaoil 1992. Ó thaobh an Rialtais, is í an Roinn Comhshaoil agus Rialtais Áitiúil a dhéanann urraíocht uirthi.

ÁR bhFREAGRACHTAÍ

Ceadúnú

Bíonn ceadúnais á n-eisiúint againn i gcomhair na nithe seo a leanas chun a chinntiú nach mbíonn astuithe uathu ag cur sláinte an phobail ná an comhshaoil i mbaol:

- áiseanna dramhaíola (m.sh., líonadh talún, loisceoirí, stáisiúin aistrithe dramhaíola);
- gníomhaíochtaí tionsclaíocha ar scála mór (m.sh., déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta);
- diantalmhaíocht;
- úsáid faoi shrian agus scaoileadh smachtaithe Orgánach Géinathraithe (GMO);
- mór-áiseanna stórais peitreacha;
- scardadh dramhuisce.

Feidhmiú Comhshaoil Náisiúnta

- Stiúradh os cionn 2,000 iniúchadh agus cigireacht de áiseanna a fuair ceadúnas ón nGníomhaireacht gach bliain.
- Maoirsiú freagrachtaí cosanta comhshaoil údarás áitiúla thar sé earnáil – aer, fuaim, dramhaíl, dramhuisce agus caighdeán uisce.
- Obair le húdarais áitiúla agus leis na Gardaí chun stop a chur le gníomhaíocht mhídhleathach dramhaíola trí chomhordú a dhéanamh ar líonra forfheidhmithe náisiúnta, díriú isteach ar chiontóirí, stiúradh fiosrúcháin agus maoirsiú leigheas na bhfadhbanna.
- An dlí a chur orthu siúd a bhriseann dlí comhshaoil agus a dhéanann dochar don chomhshaoil mar thoradh ar a ngníomhaíochtaí.

Monatóireacht, Anailís agus Tuairisciú ar an Gcomhshaoil

- Monatóireacht ar chaighdeán aeir agus caighdeán aibhneacha, locha, uisce taoide agus uisce talaimh; leibhéil agus sruth aibhneacha a thomhas.
- Tuairisciú neamhspleách chun cabhrú le rialtais náisiúnta agus áitiúla cinntí a dhéanamh.

Rialú Astuithe Gáis Ceaptha Teasa na Héireann

- Cainníochtú astuithe gáis ceaptha teasa na hÉireann i gcomhthéacs ár dtiomantas Kyoto.
- Cur i bhfeidhm na Treorach um Thrádáil Astuithe, a bhfuil baint aige le hos cionn 100 cuideachta atá ina mór-ghineadóirí dé-ocsaíd charbóin in Éirinn.

Taighde agus Forbairt Comhshaoil

- Taighde ar shaincheisteanna comhshaoil a chomhordú (cosúil le caighdeán aeir agus uisce, athrú aeráide, bithéagsúlacht, teicneolaíochtaí comhshaoil).

Measúnú Straitéiseach Comhshaoil

- Ag déanamh measúnú ar thionchar phleananna agus chláracha ar chomhshaoil na hÉireann (cosúil le pleananna bainistíochta dramhaíola agus forbartha).

Pleanáil, Oideachas agus Treoir Chomhshaoil

- Treoir a thabhairt don phobal agus do thionscal ar cheisteanna comhshaoil éagsúla (m.sh., iarratais ar cheadúnais, seachaint dramhaíola agus rialacháin chomhshaoil).
- Eolas níos fearr ar an gcomhshaoil a scaipeadh (trí cláracha teilifíse comhshaoil agus pacáistí acmhainne do bhunscoileanna agus do mheánscoileanna).

Bainistíocht Dramhaíola Fhorghníomhach

- Cur chun cinn seachaint agus laghdú dramhaíola trí chomhordú An Chláir Náisiúnta um Chosc Dramhaíola, lena n-áirítear cur i bhfeidhm na dTionscnamh Freagrachta Táirgeoirí.
- Cur i bhfeidhm Rialachán ar nós na treoracha maidir le Trealamh Leictreach agus Leictreonach Caite agus le Srianadh Substaintí Guaiseacha agus substaintí a dhéanann ídiú ar an gcríos ózóin.
- Plean Náisiúnta Bainistíochta um Dramhaíl Ghuaiseach a fhorbairt chun dramhaíl ghuaiseach a sheachaint agus a bhainistiú.

Struchtúr na Ghníomhaireachta

Bunaíodh an Ghníomhaireacht i 1993 chun comhshaoil na hÉireann a chosaint. Tá an eagraíocht á bhainistiú ag Bord Iánamseartha, ar a bhfuil Príomhstíúrthóir agus ceithre Stíúrthóir.

Tá obair na Ghníomhaireachta ar siúl trí ceithre Oifig:

- An Oifig Aeráide, Ceadúnaithe agus Úsáide Acmhainní
- An Oifig um Fhorfheidhmiúchán Comhshaoil
- An Oifig um Measúnacht Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáide

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag ball air agus tagann siad le chéile cúpla uair in aghaidh na bliana le plé a dhéanamh ar cheisteanna ar ábhar imní iad agus le comhairle a thabhairt don Bhord.



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