Depolluting End-of-Life Vehicles

Guidance for Authorised Treatment Facilities

defra
Department for Environment Food and Rural Affairs

dti

This advice was commissioned by DEFRA and DTI from AEA Technology Environment and Universal Vehicle Services. It is based on practical dismantling trials carried out during 2002/3 and is intended to reflect current best practice.

Contents

1 Introduction

In future, the way in which vehicles reaching the end of their useful life are processed will have to change. About 2 million end-of-life vehicles (ELVs) are generated each year in the UK. These will be classified as hazardous waste, and will need to be depolluted, as a consequence of European legislation, prior to dismantling, crushing, or shredding. All facilities treating ELVs will be affected by this legislation.

This is guidance on how to depollute an ELV. If you carry out the procedures in this guidance, then you will have achieved a depolluted ELV which will then be classed as non-hazardous. However, you can achieve this even if you do not use these particular guidance methods (provided you have ensured that you can demonstrate the same levels of depollution). Non-destructive methods of removing hazardous components may be carried out, provided that component integrity is not compromised.

A system for recording the quantity of fluids and other items which have been removed must be developed. The information which is recorded will enable regular reports to be provided to waste regulators.

This guidance initially briefly covers:

- The relevant new legislation on both ELVs (the ELV Directive) and hazardous waste (the European Waste Catalogue)
- Health and safety considerations
- Equipment and facilities.

The depollution operations which need to be conducted to meet the requirements of the new legislation are then described.

The depollution procedure is only one stage in the overall process required to treat an ELV. Other operations, such as conducting the required administrative activities, and complying with all existing legislation relating to these activities, will still need to be conducted, but are not discussed in this guidance document.

1.1 LEGISLATION

The relevant pieces of legislation are:

1. The European End-of-Life Vehicles (ELV) Directive (2000/53/EC)
2. The updated versions of both the European Waste Catalogue (EWC) and Hazardous Waste List (HWL) (2000/532/EC) and its subsequent amendments.

1.1.1 End-of-Life Vehicles Directive

The ELV Directive introduces measures to promote and increase recycling and to further protect the environment by requiring adequate depollution (e.g. draining of fluids such as engine oil) and sets minimum technical requirements for the treatment of ELVs. Following the introduction of the End-of-Life Vehicles Regulations 2003 (Statutory Instrument 2003, No.2635), ELV treatment facilities carrying out depollution need to be licensed as “authorised treatment facilities” (ATFs) by the environment agencies. .

The depollution requirements of the ELV Directive are given below.

Extract from ANNEX I
Minimum technical requirements for treatment in accordance with Article 6(1) and (3)

3. Treatment operations for depollution of end-of-life vehicles:
— removal of batteries and liquefied gas tanks,
— removal or neutralisation of potential explosive components, (e.g. air bags),
— removal and separate collection and storage of fuel, motor oil, transmission oil, gearbox oil, hydraulic oil, cooling liquids, antifreeze, brake fluids, air-conditioning system fluids and any other fluid contained in the end-of-life vehicle, unless they are necessary for the re-use of the parts concerned,
— removal, as far as feasible, of all components identified as containing mercury.

The individual hazardous components and materials removed during depollution should be kept separate.

Clearly, ATFs need to remain vigilant for any other hazardous materials or items that might be encountered in the course of their operations.

1.1.2 European Waste Catalogue and the Hazardous Waste List

The European Waste Catalogue (EWC) and Hazardous Waste List (HWL) were first published in 1994. These are used for the classification of all wastes and hazardous wastes, and are designed to form a consistent waste classification system across the EU. They form the basis for all national and international waste reporting obligations, such as those associated with waste licenses and permits, and the transport of waste. They were implemented in the UK by the Special Waste Regulations (1996).

Updated versions of both the European Waste Catalogue and Hazardous Waste List were published as a homogenised list of hazardous and non-hazardous wastes in 2001, and came into force on 1 January 2002. The updated EWC now includes ELVs (Category 16 01) and lists a number of hazardous wastes in this category. This list is more comprehensive than that in the ELV Directive, and also applies to all vehicles whereas the ELV Directive only applies to a specified range of vehicles.

Although the new EWC could be interpreted as implying that, for example, every drop of engine oil must be removed in order to classify an ELV as non-hazardous, the cost for achieving this would be high. Further, there may be little additional environmental benefit in removing the very small quantity of oil which is likely to remain in practice. Consequently, this guidance document has been prepared based on practical trials which have been shown to achieve an acceptable level of decontamination which would meet the requirements of both the ELV Directive and the new EWC.

1.2 HEALTH & SAFETY CONSIDERATIONS

Vehicle depollution will involve removing fluids which may be either explosive or corrosive. The legislation covering this area includes:

- The Management of Health & Safety at Work Regulations 1999 – these require risk assessments on activities, employees to be informed of the risks, and preparation of emergency procedures.

- The Control of Substances Hazardous to Health Regulations 1999 (COSHH) – these require assessments of the risks to health of employees from each hazardous substance.

- Proposed new legislation under the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) which will cover risks of fire and explosion from hazardous substances. These will replace existing requirements on highly flammable substances (e.g. the Highly Flammable Liquids and Liquefied Gases Regulations 1972). This will also cover storage.

Further guidance on health and safety considerations can be obtained in the Health & Safety Executive's leaflet "Reducing Ill Health and Accidents in Motor Vehicle Repair" (INDG356).

1.3 EQUIPMENT

It is recommended that depollution activities are conducted using equipment which has been specifically designed for carrying out the required depollution operations. The use of such equipment ensures that a high level of depollution (removal of over 98% of fluids contained in the ELV) can be achieved in a relatively short time-frame (20-30 minutes per ELV).

ATFs can decide to use simpler, alternative methods to achieve the same levels (over 98% removal of fluids) of depollution, but health and safety requirements should not be compromised. An assessment of the risks involved in using alternative methods of depollution must be carried out and measures necessary to comply with relevant health and safety legislation put in place. In addition, if alternative methods are used, these will need to be able to demonstrate at least the same level of depollution has been achieved .

The majority of commercially available equipment is usually operated pneumatically. Consequently, the compressor used to power this equipment must have sufficient capacity to ensure that the equipment can operate satisfactorily.

1.4 FACILITIES

Sites for ELV treatment and storage (including temporary storage) of end-of-life vehicles prior to their treatment must have:

Sites for Storage

- impermeable surfaces for appropriate areas with appropriate spillage collection facilities.
- equipment for the treatment of water, including rainwater.

Sites for Treatment

- impermeable surfaces for appropriate areas with appropriate spillage collection facilities.
- equipment for the treatment of water, including rainwater.
- appropriate storage for dismantled spare parts, including impermeable storage for oil-contaminated spare parts,
- appropriate containers for storage of batteries (with electrolyte neutralisation on site or elsewhere), filters and PCB/PCT-containing condensers,
- appropriate storage tanks for the segregated storage of end-of-life vehicle fluids
- appropriate storage for used tyres, including the prevention of fire hazards and excessive stockpiling.

DEFRA guidance notes covering this part of the ELV regulations can be found at http://www.defra.gov.uk/environment/waste/topics/elv-guidance.pdf

The health & safety implications of storing large quantities of hazardous and/or highly flammable materials need to be properly assessed in consultation with the Health & Safety Executive, and the Environment Agency should be consulted on any environmental implications.

2 Example of the depollution process

In order to depollute an ELV, a number of operations have to be conducted. An example sequence is shown in Table 1 and the Process Flow Diagram. This was developed from practical trials with one make of proprietary equipment. As a different sequence of operations may be more suitable for other types of equipment, treatment facilities can develop an alternative sequence. However, if a different sequence of operations is developed, this alternative sequence should recognise that it can typically take up to 20 minutes within the sequence for gravity draining of the engine oil.

Table 1 indicates whether an individual operation is best conducted either above or below the ELV.

Table 1 - Possible depollution sequence

Above / Below (A / B) vehicle	Operation
A	Remove battery
A	Remove fuel filler cap and oil filler cap
A	Set heater to maximum
A	Remove wheels and separate lead balance weights
A	Remove any parts identified as containing mercury
Put vehicle onto support frame	
B	Drain engine oil and remove oil filter
B	Drain transmission oil, including rear differential if applicable
A	De-gas air conditioning unit (if fitted)
B	Drain coolant
B	Drain brake fluid
B	Remove catalyst (if fitted)
A	Drain washer bottle
A	Drain brake / clutch reservoir
A	Drain power steering reservoir (if fitted)
B	Drain fuel tank
B	Drain shock absorbers or remove suspension fluid
B	Replace drain plugs / fit plastic stoppers
Remove vehicle from support frame	
A	Remove air bags (if fitted, and can not be deployed in-situ)
A	Deploy airbags in-situ (if fitted and able to conduct this operation)

Although a number of the below-vehicle operations can be conducted in parallel, the sequence of operations shown in Table 1 maximises the time for gravity draining of the engine oil.

Removal of the wheels/tyres is not a depollution requirement (but removal of lead balancing weights is required). However, removal will allow better access for draining of

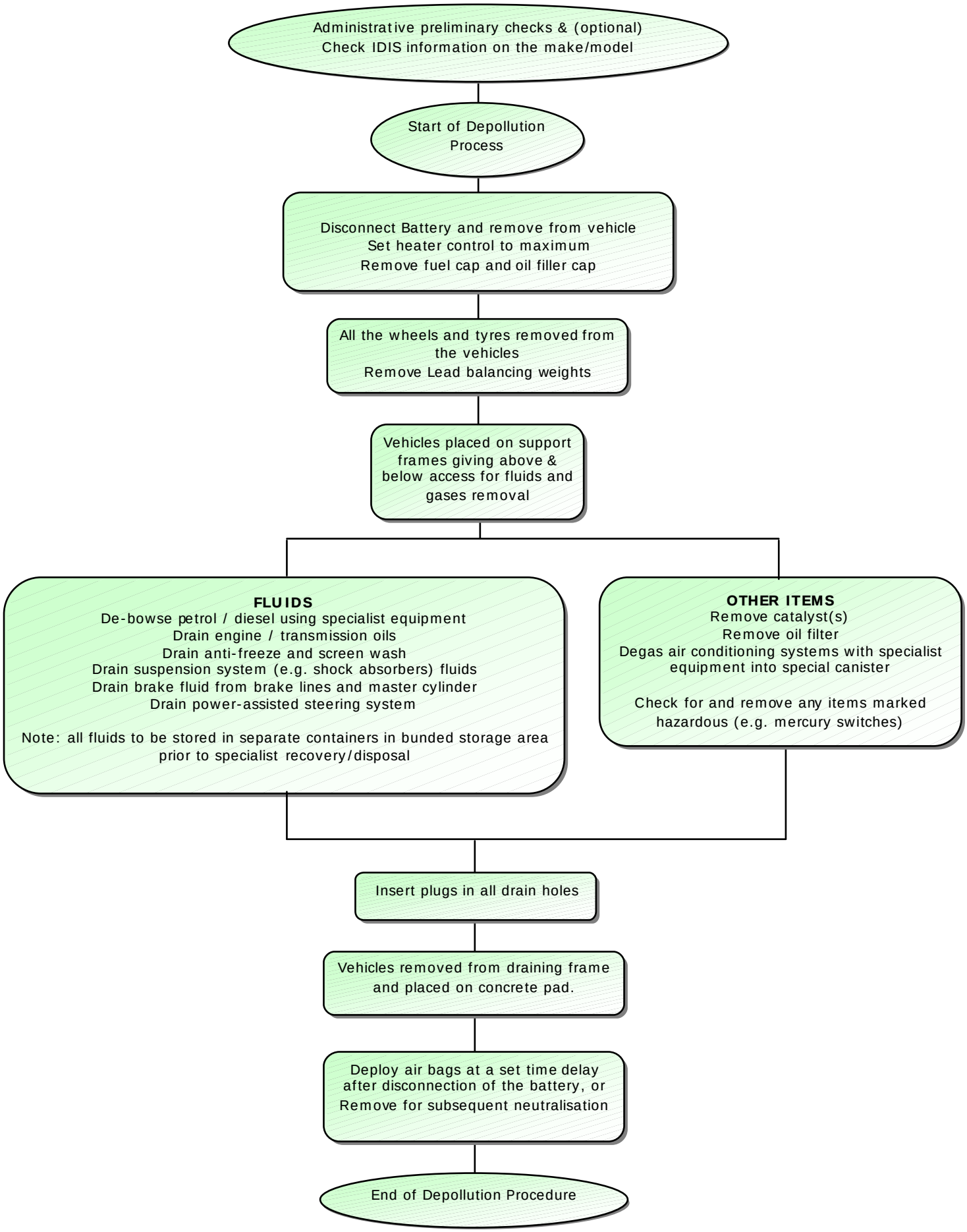
the shock absorbers, but, depending on the type of equipment being used, it may be easier to perform the above-vehicle depollution activities (such as removal of screen washer fluid) at ground level before the wheels are removed. However, whatever sequence is used, tyre removal depends on the individual shredder receiving the depolluted ELV hulks. In the absence of stipulated shredder's requirements being known, then tyres should be removed.

The depollution sequence shown in Figure 1 and Table 1 can be represented as 3 stages:

- Preliminary activities
- Removal of fluids and other items
- Removal or deployment of air bags

The procedures required to complete each stage are described in the remaining sections of the manual.

After each depollution operation has been conducted, the fluid or item which is removed must be transferred to a suitable storage facility as soon as possible.


Administrative preliminary checks & (optional)
Check IDIS information on the make/model
Start of Depollution Process
Disconnect Battery and remove from vehicle
Set heater control to maximum
Remove fuel cap and oil filler cap
All the wheels and tyres removed from the vehicles
Remove Lead balancing weights
Vehicles placed on support frames giving above & below access for fluids and gases removal
FLUIDS
De-bowse petrol / diesel using specialist equipment
Drain engine / transmission oils
Drain anti-freeze and screen wash
Drain suspension system (e.g. shock absorbers) fluids
Drain brake fluid from brake lines and master cylinder
Drain power-assisted steering system
Note: all fluids to be stored in separate containers in bunded storage area prior to specialist recovery/disposal
OTHER ITEMS
Remove catalyst(s)
Remove oil filter
Degas air conditioning systems with specialist equipment into special canister
Check for and remove any items marked hazardous (e.g. mercury switches)
Insert plugs in all drain holes
Vehicles removed from draining frame and placed on concrete pad.
Deploy air bags at a set time delay after disconnection of the battery, or
Remove for subsequent neutralisation
End of Depollution Procedure

3 Preliminary activities

These activities prepare the ELV for the next stage of the process (removal of fluids and other items). The activities which need to be conducted are:

- Use of IDIS or other manufacturer guidance to obtain depollution information on the ELV
- Determine if ELV has airbags
- Lower windows (if required)
- Remove battery
- Remove fuel cap and oil filler cap
- Set heater control to maximum
- Remove wheels/tyres
- Remove lead balance weights from wheels

All of these activities need to be conducted before the ELV is placed on a support frame to enable the below-vehicle activities to be conducted.

All required administrative procedures should be completed before any of the preliminary activities are conducted.

3.1 USE OF IDIS

IDIS (the International Dismantling Information System) has been developed by vehicle manufacturers and provides information on both the depollution and dismantling of ELVs. IDIS should be consulted to obtain information on any specific depollution procedures which may be required, and to obtain information on procedures for removal or in-situ deployment of air bags.

The information provided in IDIS is regularly updated. Treatment facilities must ensure that they are using the latest version.

Note: IDIS is one method of obtaining depollution information but is not the only method. Appropriate information should be sought from wherever suitable.

3.2 DETERMINE BY INSPECTION IF THE ELV CONTAINS AIRBAGS.

The number of air bags in an ELV can range from 1 (in the steering wheel) to 10 or more. These may have already been deployed if the vehicle has been classified as an ELV as a result of damage sustained during an accident.

If a visual inspection identifies that the ELV does contain one or more airbags, and these have not been deployed, then these will have to be either removed for subsequent detonation or deployed in-situ. For safety reasons, neither of these activities (which are described later in this guidance document) is to be conducted until at least 20 minutes after the battery has been removed from the ELV.

It is recommended that air bags are deployed in-situ using suitable equipment. If this approach is used, then the side windows must be lowered. These may be electrically operated and so need to be lowered before the battery is removed.

3.3 REMOVE BATTERY

This is easily removed with standard tools. The battery must be removed, for health and safety reasons (prevention of possible electrical discharge igniting fuel) before the fuel tank is depolluted.

3.4 REMOVE OR OPEN FILLER CAPS

The fuel cap and the oil filler cap must be either removed or opened. This enables the fuel and oil to be drained more easily.

3.5 HEATER CONTROLS

In order to ensure that coolant in the heater unit can be drained, the heater controls must be set at the position which would provide the maximum amount of heat.

As there may be health and safety concerns regarding sitting in the vehicle to conduct this operation, it should be done by reaching into the vehicle.

3.6 REMOVE WHEEL BALANCING WEIGHTS

For all wheels, including the spare wheel, any lead balancing weights must be removed from the wheels and placed in a suitable storage container.

4 Removal of fluids and other items

The activities which need to be conducted are:

Fluids	Other items
Drain engine oil and remove oil filter	Remove catalyst (if fitted)
Drain transmission oils	Drain air conditioning refrigerant (if fitted)
Drain coolant	Remove LPG tank (if fitted)
Drain hydraulic oils	Identify and remove items containing mercury
Drain screen-washing fluid	Identify and remove other hazardous items
Drain fuel tank	
Drain suspension system	

All fluids which are removed will need to be stored in separate containers in a bunded storage area prior to specialist recovery or disposal. As a minimum, separate containers will be required for each fluid separately identified as a category in the Hazardous Waste List. (The Waste Oils Directive seeks to promote the regeneration of oils. Any mixing of fluids like oils may restrict the possibilities for recycling)

The ELV will need to be placed on a support frame which allows easy access below the vehicle before a number of these operations can be conducted. Although access to the underneath of a vehicle could be provided by placing it above a pit, there are health and safety issues with this approach, particularly with regard to possible build-up of fuel vapour in the pit (and hence risk of explosion/fire) during the depollution procedure. Consequently, the vehicle must be placed on a support frame which enables easy access to the underside of the vehicle at ground level.

The first activity to be conducted is to start draining of the engine oil. Other activities can be conducted in parallel, but the engine oil can typically take 20 minutes to reach the point where no further draining is visible.

It is recommended that depollution activities are conducted using equipment which has been specifically designed for carrying out the required depollution operations. The use of such equipment, while not essential, ensures that a high level of depollution can be achieved in a relatively short time-frame (20-30 minutes per ELV).

The guidance presented in this section of the document describes the procedures which need to be conducted in order to achieve the required level of depollution. The instructions provided with any commercial equipment which is used must also be followed in order to ensure that this level of depollution is achieved.

4.1 ENGINE OIL

This is gravity drained by removing the drain plug at the bottom of the sump and collecting the oil. If commercially available equipment for collecting the oil is not used, the oil must be collected in a suitable container which has a minimum volume of 10 litres.

The oil must be allowed to drain for a minimum of 20 minutes, or until such time as no visible further draining of oil is occurring.

4.1.1 Oil filter

The oil filter must be removed. This should be done by using a suitable spanner/tool which does not puncture the oil filter during removal.

The oil filter must be treated to remove residual oil. This can be achieved by crushing the filter and recovering the oil. Commercial equipment which performs this function is available. Alternatively, the oil filters can be sent to a suitable treatment facility.

4.2 TRANSMISSION OILS

Transmission oil is contained in both manual and automatic gearboxes, and in the rear axle differential of rear wheel drive vehicles.

4.2.1 Manual gearbox

If the gearbox has a drain plug, it can be gravity drained by removing the drain plug and collecting the oil in a suitable container which has a minimum volume of 5 litres.

The oil must be allowed to drain for a minimum of 10 minutes with no visible further draining occurring.

Gearboxes which do not have a drain plug must be drained by drilling a suitably sized hole in the bottom of the gearbox. Commercial equipment includes a suitable drill, provides suction to assist in draining the gearbox, and collects the oil without the need for a container underneath the gearbox.

The commercial equipment can also be used to drain gearboxes which have a manual drain plug.

4.2.2 Automatic gearbox

Oil has to be drained from both the gearbox and the torque converter. These may be combined in a single unit, but the torque converter on some types of gearboxes is separate from the main gearbox unit.

The procedure for draining these is the same as for a manual gearbox.

4.2.3 Rear differential

Most cars are front wheel drive and so do not have a rear differential unit. However, many small commercial vans and some larger cars have rear wheel drive.

The procedure for draining these is the same as for a manual gearbox.

4.3 COOLANT (ANTIFREEZE)

Coolant can be gravity drained by removing the bottom hose from the radiator and collecting the liquid in a suitable container with a minimum volume of 10 litres. Commercial equipment enables the operator to make a hole in the bottom hose and suck the coolant out through this hole into a container. Either method can be used, but will

only be able to achieve a high level of removal if the heater valve was set to maximum as part of the preliminary activities.

Drainage time of 10 minutes, with no visible further drainage occurring.

4.4 HYDRAULIC OILS

All ELVs contain brake fluid. The other hydraulic oils which ELVs may contain are clutch fluid and power-assisted steering fluid.

4.4.1 Brake fluid

Commercial equipment uses suction on both the reservoir and the brake pipes and cylinders (fluid is sucked from the bleed nipples) to remove the fluid. Brake fluid could also be removed from an ELV by opening the brake bleeding nipples and then pumping the brake pedal until the reservoir is emptied (the fluid would be discharged through the open nipples). However, there are health and safety concerns relating to an operative sitting in an ELV, and this approach removes a lower percentage of brake fluid than commercially available equipment. Consequently, in order to achieve the required percentage of removal, brake fluid must be removed using equipment which uses suction on both the reservoir and the brake pipes and cylinders.

Drainage time of 10 minutes, no visible fluid left in the reservoir and with no visible further drainage following removal of suction equipment.

4.4.2 Clutch fluid

Some cars can have hydraulic clutches, but virtually all modern cars have cable clutches and so do not contain any hydraulic clutch fluid. If an ELV has a hydraulic clutch, equipment similar to the equipment used to extract brake fluid from the brake reservoir can be used to extract fluid from the clutch reservoir.

4.4.3 Power steering oil

If the ELV has power steering, fluid has to be extracted from both the reservoir and the connecting hose. Equipment similar to that used to extract brake fluid from the brake reservoir can be used to extract fluid from the power steering oil reservoir. Fluid is then removed from the hose by cutting it at the lowest point and allowing the fluid to gravity drain.

4.5 SCREEN WASHING FLUID

This is removed by sucking fluid from the reservoir. The pipe placed in the reservoir has to be long enough to reach the bottom of the reservoir.

End point – no visible further amounts of fluid in the reservoir.

Either commercially available equipment, or a simple pump, can be used. If a simple pump is used, the reservoir must be inspected to determine that it has been completely emptied.

Most cars have one reservoir container which supplies fluid to both the front and rear windows, but some cars may have a separate container (in the boot) for the rear window. If a vehicle has more than one reservoir than all reservoirs must be drained.

4.6 FUEL TANK

Fuel can be removed by suction or siphoning it from the tank with a tube which enters the tank through the fuel filling pipe, but this procedure is unlikely to achieve the required level of depollution.

In order to ensure that the required level of depollution is achieved, a hole is drilled into the lowest point of the fuel tank and suction is used to remove fuel. This ensures that no vapour is released during extraction.

The health and safety issues associated with fuel extraction mean that the drill should be pneumatically powered, and an earthing connection must be made between the vehicle and the extraction equipment. Commercially available equipment meets both these requirements, and should be used for this operation.

The design of the tank (for example a saddle shaped tank will have two low points), may require more than one hole to be drilled in order to extract all of the fuel.

End-point – no visible further removal for fluid observed in the (see-through) extraction tubing.

There is no requirement to remove any residual fuel from the injector/carburettor inlet pipe in the engine compartment.

4.7 SUSPENSION SYSTEM

The suspension system on most vehicles is provided by 4 independent shock absorbers (one for each wheel). However, alternative systems are used in some vehicles.

4.7.1 Shock absorbers

Shock absorber fluid can be removed from an ELV by removing the shock absorbers. The time required to conduct this operation may be considerable, and the shock absorbers would be classified as hazardous waste after they were removed from the ELV.

The recommended approach is to drain the fluid from the shock absorber without removing it from the ELV. Shock absorbers contain fluid in both an inner and an outer cylinder. Consequently, in order to achieve the required level of depollution, fluid needs to be removed from both the inner and the outer cylinder.

Commercially available equipment can achieve the required level of depollution, but the time required for this operation will depend on the design of the equipment. The instructions provided by the manufacturer must be followed.

4.7.2 Sealed suspension systems

Equipment is available for both removing and recharging these, and thus can be used to drain them. An alternative approach is to fit an adapter to the filling/draining valve; this then enables the liquid to be gravity drained in about 20-25 minutes.

No visible further draining of fluids should occur after the above procedures.

4.7.3 Gas suspension systems

Some types of equipment designed for fluid based shock absorbers may be suitable for safely removing the gas from gas suspension systems. This must be confirmed with the manufacturer of the equipment before it is used for this purpose, and any additional

safety requirements or other instructions provided by the manufacturer must be followed.

4.8 CATALYST

Older ELVs may not contain a catalyst, but all modern vehicles, both petrol and diesel, will have a catalytic conversion unit in the exhaust system. The catalyst can be identified by visual inspection of the exhaust system.

Note: although not strictly a depollution activity, this is a recycling activity the financial benefits of which can generally be exploited to offset the costs of depollution.

The catalyst unit can easily be removed by cutting through the exhaust pipe, both in front of, and behind, the catalyst unit. The use of the correct cutting equipment reduces the time which is required for this operation.

Some vehicles may have more than 1 catalyst unit; all catalyst units must be removed.

4.9 AIR CONDITIONING REFRIGERANT

The two types of refrigerant that are used in vehicle air conditioning systems are R12 and R134a. The type of refrigerant is marked on the vehicle.

The refrigerant must be removed using specialist equipment, and two collection cylinders are required; one for R12 (a CFC) and one for R134a (an HFC). The equipment is attached to the air conditioning filler valve, and takes about 10-12 minutes (the time depends on the system and the ambient air temperature) to remove all the fluid and transfer it to the collection cylinder.

4.10 LPG TANK

Currently, very few ELVs have these, but the number is likely to increase in the future. The usual procedure for removing these is to:

1. Turn off the isolating valve
2. Cut through the connecting pipes using a hand-saw
3. Cut through the retaining clamps or straps
4. Remove the tank to safe storage

Given that there are health & safety issues involved with removal, handling and storage of LPG tanks, ATFs are recommended to check with the Health & Safety Executive (HSE) on current guidance.

Information on subsequent treatment of removed LPG tanks should be sought from authoritative sources (e.g. the LPG tank supplier, CARE Group etc.). ATF's may wish to decide that subsequent LPG tank emptying, purging and tank destruction be carried out by specialist third party decommissioners.

4.11 SWITCHES CONTAINING MERCURY

Some switches, such as tilt-based switches, may contain mercury. The ELV Directive requires switches which contain mercury to be removed. It would be a long (and hence costly) process to remove all switches in case they contained mercury.

An acceptable level of depollution will be achieved if any switches which are clearly marked as containing mercury are removed. A visual inspection of areas which contain this type of switch must be made during the depollution procedure, but only switches which are clearly marked as containing mercury need to be removed.

4.12 OTHER HAZARDOUS ITEMS

Some older ELVs may contain asbestos (e.g. certain brake pad linings). Regulations require the location of any components which may contain asbestos to be identified on the vehicle. A visual inspection of the vehicle must be made during the depollution procedure to identify if the ELV contains any notices indicating parts which contain asbestos. If any asbestos containing components are identified during this procedure, they must be removed. The procedure used to remove the asbestos containing components must follow all health and safety guidelines relating to asbestos.

ELVs also contain other hazardous items, such as the liquid crystal displays (LCDs) used in instrument panels in newer vehicles. There is currently no requirement to remove any of these items, but further guidance may be provided in due course.

When all of the activities on removal of fluids and other items have been completed, suitable plugs must be inserted in each drain hole.

5 Removal or deployment of air bags

Any undeployed air bags or seat belt pre-tensioners must be removed or deployed.

The ELV Directive requires air bags to be either removed or deployed because they are explosive components. As air bags are electrically operated, they can be disabled by disconnecting the battery of the ELV. However, they need to be removed or deployed in order to prevent problems occurring during subsequent metal recycling operations.

Undeployed air bags can be removed and stored. However, as they are explosive devices, the storage facility would have to meet all relevant regulations and requirements for storage of explosive materials. There are also health and safety issues associated with the storing of undeployed air bags. Consequently, the recommended procedures are to either:

- Remove the air bag and deploy it immediately, or
- Deploy the air bag within the vehicle

If an ELV only contains one airbag (in the steering wheel), it is a relatively simple, and short, procedure to remove this in accordance with the guidelines provided by the Health and Safety Executive. However, there must be a minimum period of about 20 minutes (check manufacturer's recommended delay times) from the time the battery is removed before any removal of air bags commences. This is because the air bag may have a residual charge which might result in it being detonated as it was removed, but any residual charge is lost if the airbag is not connected to a battery for more than the manufacturer's recommended time delay. The air bag can then be deployed in accordance with health and safety guidelines. Commercial equipment for this is available, but suitable equipment can also be constructed. As different air bags use different connections, a number of connection adapters will be required.

The equipment used for detonating air bags which have been removed from an ELV must enable the operator of the equipment to be a minimum of 20 metres from the air bag when it is deployed. Suitable procedures which ensure that no other person will be within 20 metres of the airbag when it is deployed must be followed.

More modern cars frequently contain at least 2 airbags, and some luxury cars may well have more than 10 air bags. As removal of all air bags would be a time consuming process, a better alternative for deploying air bags would be to use equipment which enables them to be remotely deployed in the vehicle. Suitable equipment is available, but it may not be possible to locate a suitable connection point, and a special connection tool/adapter may also be required. Manufacturer's advice should be sought, if not provided in IDIS.

If car doors are to be kept shut, then car windows should be lowered before air bags are deployed *in situ* to avoid possible glass breakage and expulsion resulting from 'containment' of the explosive force. Consequently, if an ELV has electrically operated windows, these will need to be lowered before the battery is removed.

If air bags are deployed *in situ*, measures to ensure that neither the operator of the equipment, or any other person, is within 20 metres of the vehicle when the air bags are detonated, must be implemented.

The level of noise produced during the deployment of air bags must be assessed, and discussed with the local authority, particularly if the treatment facility is close to a residential area.

Although this guidance describes the general procedures, ATFs should ensure that any specific guidelines provided by vehicle manufacturers are followed.

5.1 SEAT-BELT PRE-TENSIONERS

ELVs which contain air bags may also contain seatbelt pre-tensioners. These are designed to fire before or at the same time as the airbags are deployed, to clamp the seat belt wearer irresistibly to the seat preventing them from gaining too much acceleration or twisting before they hit the airbag. As they also contain explosive devices, they need to be deployed as part of the depollution procedure. Manufacturers will have to provide proper guidance on the removal and deployment of seat belt pre-tensioners.

Seatbelt pre-tensioners can easily be removed and then detonated. Manufacturer's advice on this should be sought. However, the use of a procedure which enables air bags to be detonated in-situ will also detonate seat belt pretensioners. Consequently, in-situ detonation at the same time as air bags is the recommended approach for these items.

6 End of depollution procedure

When all of the depollution activities described in this guidance document have been conducted, the ELV is classified as non-hazardous waste. The ELV can then be recycled.

All fluids and other items which have been removed (apart from any air bags which have been deployed) will still be classified as hazardous waste. These will need to be stored in suitable storage facilities, which meet all regulations, until they are either treated or sent for recycling or disposal through a suitably licensed waste management contractor.

A system for recording the quantity of fluids and other items which have been removed should be developed. The information which is recorded will enable regular reports to be provided to waste regulators.