Practical Restoration Handbook

Plant

by

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CONTENTS

Note: The use of **Pumps** is described in the chapter on **Dewatering**.
The use of **Excavators** is described in the chapter on **Excavation**.
The uses of **Chain-Saws, Brush-Cutters & Hand-Operated Winches** are described in the chapter on **Vegetation Clearance**.
Health and Safety is the subject of a separate chapter so only points specific to the plant under consideration are covered in detail here.

1. INTRODUCTION

1.1 In the beginning were the pick, the shovel and the wheelbarrow. With little more than these three basic items of equipment was much of Britain's canal network constructed by the original *Navvies*.

1.2 With little more than these same three basic items did what have been called the *New Navvies*, the volunteers who have already helped restore over 300 formerly derelict miles of that network, begin their work. It soon became clear, however, that hand tools were no longer adequate when the numbers of Navvies could be counted in tens rather than the thousands of their forebears and their labours were additional to, rather than forming the substance of, their full-time employment. The use of the more sophisticated tools and mechanised plant made available by technological progress in the intervening two hundred years became an absolute necessity if the rate of restoration was ever to outstrip that of the continuing slide into dereliction.

1.3 Most common items of plant are described in the chapters of the Practical Restoration Handbook which covers the applications with which they are particularly associated. This one aims to fill some of the gaps.

1.4 Where appropriate, peripheral operational considerations are also discussed.

2. HEALTH & SAFETY

2.1 If you look at photographs of volunteers working on canals during the 1960's & 70's you will see little evidence of safety consciousness. Sites were rarely fenced, hard hats rarely worn, *Totectors*™ virtually unknown, etc. Despite this, accidents were extremely rare and the few that did occur were minor. However, the increased general awareness of safety issues and the additional risks that arise from the greater use of mechanised plant now renders unacceptable such a relaxed approach. Safety is now not just a priority, it *is* the priority.

2.2 Three groups of people must be considered:

- the plant operator(s) on the active site
- other site workers on the active site
- the general public on the active site AND THE INACTIVE SITE

2.3 Active sites present more obvious risks but water and fall hazards may be present even when the workers aren't. "Fallow" periods are, of course, longer on volunteer sites than on professional ones so, if anything, even greater care is needed.

2.4 **The public** are best protected by appropriate fencing. This can range from orange tape round a few lamp irons (for temporary, shallow excavations) to a full post and rail fence (at the top of a long-term empty lock). However, when plant is in use close to a footpath, fencing alone may be insufficient and it may be wise to erect warning signs and even detail someone to escort people past the site. Do not be surprised, however, if some refuse to wait for safe passage. The 1994 Waterway Recovery Group (WRG) Reunion Dig at Derby was notable for the number of (particularly) cyclists who ignored the legal path diversion order and forced their way past both barriers and stewards to ride over winch cables and under trees being felled.

2.5 **Site workers** are, to a large extent, responsible for their own safety. They should keep clear of working plant, never, for example, taking short-cuts over taut winch cables or through the working arcs of excavators, and should not take breaks in the shelter of plant, tempting though getting out of the sun/wind/rain can be. If they fall asleep and the driver forgets to make his pre-starting inspection they could quickly become ex-workers.

2.6 Most plant is designed to take the operator only; lifts should neither be sought nor given.

2.7 **The plant operator** has, of course, most responsibility. Specific points are mentioned under the item(s) of plant in question but the following apply to all mechanised plant.

2.8 On all sites that participate in the IWA/WRG insurance policy, unless under tuition by an authorised Instructor, you must be authorised to use the plant in question and have your Driver Authorisation Card with you. See PRH "Health and Safety Section 2" for further details.

2.9 You must be stone cold sober before operating any plant. As alcohol takes some time to clear the system, this may preclude operating plant "the morning after the night before".

2.10 If one is available, read the instruction manual thoroughly before first acquainting yourself with the machine. Even if not, make sure you know how all the controls work and, in particular, that you know how to stop the thing before starting it. It's too late when it's running away from you and much too late when you're running away from it.

2.11 Hire plant is usually well labelled but make sure that all filling and operating points on owned plant are fully labelled.

2.12 Make sure that all guards are in place and don't try to by-pass interlocks. If any warning labels are faded or worn then replace them as they can save both money (no more diesel in the hydraulic tank) and lives (everyone knows where the emergency stop is).

2.13 If a machine's throttle sticks, stop the engine before trying to free it.

2.14 It is dangerous to operate the controls of any sit in/on machine other than when sitting in the seat. The possible consequences of accidentally knocking a machine into gear or activating a "slew" control while outside the cab are very serious indeed.

2.15 Never operate machinery when alone on site. A radio is a useful safety device if not alone but sometimes out of site, e.g. carrying materials down a towpath in a dumper.

2.16 Unless you are blessed with eyes in very strange places you will, at some time, require the services of a banksman (someone who gesticulates to you to indicate what you should do). If possible, use an experienced machine operator and only take instructions from one person at a time – though it is prudent to stop if anyone shouts to you to do so. Don't be embarrassed to get someone to guide you over bridges or round obstacles. You'll be much more embarrassed when you're stuck with two wheels in a ditch.

2.17 Except in exceptional cases all WRG sites are Hard Hat Sites but other clothing is left to the discretion of leaders and volunteers. Steel toecap boots, strong gloves and overalls are highly recommended. It is a good idea to have separate gloves for site work and operating plant; mud on the controls is neither pretty

nor conducive to safety. Be careful with your choice of ordinary clothing. Despite careful guarding, dangling bits such as belts, scarves, ties, anorak draw-cords or even uncontrolled long hair can all too easily get caught in rotating machinery, drawing in parts of the volunteers body with serious and painful consequences. See PRH "Health & Safety Section 1" for further details on personal protection equipment.

2.18 Most items of plant have limited sound insulation and some, particularly the older ones, have rather primitive exhaust silencing. The use of ear defenders, certainly by operators and possibly by others in the vicinity, is recommended. In dusty conditions you may also like to consider goggles (and possibly a dust mask) as well.

3. BUY OR HIRE?

3.1 – the perennial problem. The answer depends on a fine balance of cost and convenience and varies from group to group, site to site, job to job, and even day to day. This table will, perhaps, point you towards the things you need to think about.

	Owning	Hiring
Cost	Usually cheaper for inexpensive items used frequently – but beware of hidden expenses (e.g. insurance)	Usually cheaper for expensive items used infrequently – no hidden expenses (unless you b*****r it up)
Use	Familiar – more efficient use and less/easier operative training	Unfamiliar but more modern – meet all current regulations
Access	Easy if stored (see below) close to site – can be a problem if not	Collection and return limited to the working week
Storage	Need a secure storage facility – problems with vandalism and theft	Sensible, on-site, precautions only
Maintenance	Requires time and skills but the latter then available when needed	Usually well maintained but usually no breakdown cover at weekends
Specials	Can adapt items if required	Standard items only
Publicity	Can use as a mobile advert	Hire company publicity only

3.2 Typically, canal societies find it economical to own pumps, dumpers, wheeled excavators, generators, mixers and compressors when they can obtain them cheaply and have regular (i.e. at least monthly) use for them. All these are relatively easy to move to-and-from and between sites. A few have larger, less mobile, plant in long-term use on particular sites.

3.3 WRG maintains a stock of plant (see Appendix 2) which is available on free loan to canal societies. The societies pay transport costs and are responsible for maintenance of the plant while it is in their charge.

4. POWER SOURCES

4.1 Diesel Engines

4.1.1 The modern diesel engine (and even the museum pieces in WRG's older dumpers fall into this general category) is an amazingly reliable beast. As diesel fuel is also less flammable and much cheaper than petrol ("site only" plant runs on "red" diesel which carries no excise duty), most

plant is now diesel powered, either directly or, for example, by electricity from a diesel generator, though some barrow-hoists, concrete-mixers, generators and pumps are petrol-powered (for lightness). Smaller machines typically have hand-start, single-cylinder, air-cooled engines, though two- and three-cylinder engines are not unusual. Modern equipment tends to be larger, with water-cooled, three- or four-cylinder, electric-start engines.

4.1.2 Unlike petrol engines, in which the fuel/air mixture is ignited by an electrical spark, diesels rely on the heat generated by the compression of the air in their cylinders spontaneously to ignite the fuel. To generate sufficient heat the compression ratio has to be much higher than in a petrol engine, typically 20:1 c.f. 8:1, making it virtually impossible to turn even a small diesel engine by hand. Consequently, hand-start diesels have small levers (one per cylinder) mounted on the cylinder head cover(s) which, when turned through 90-150° (varying from engine to engine), open the exhaust valve(s) slightly, allowing some pressure to escape. These, unsurprisingly, are known as "decompressors".

4.1.3 Tough as the proverbial old boots diesels may be; nevertheless, they are not totally immune to neglect and abuse. **Regular maintenance** is the key to long and reliable operation. Consequently, check as many of the following as are applicable to the engine of your machine before starting it each morning:

- Lubricating oil level
- Cooling water level
- Belt conditions and tensions
- Fuel level (see 4.3)
- Check also for leaks, loose nuts and bolts, etc.
- Checks appropriate to specific machines are covered in the appropriate sections.

4.1.4 Rectify any problems before using the machine. This may be easier said than done but is preferable to the trouble that will ensure if you don't.

4.1.5 **Starting** is best carried out according to the instruction manual, if available. If it isn't the following may provide useful general guidance:

4.1.6 If relevant, ensure that the machine is in neutral gear and that the hand-brake is on.

4.1.7 If hand-starting, make sure you know which way the engine runs (counter/clockwise) and that you have the right starting handle. Some are reversible. If so, make sure the ratchet is correctly set. There are few surer ways of kn*****ing yourself than trying to start a diesel engine in the wrong direction. Before starting, lightly grease the shaft and turn the handle the 'wrong' way to ensure that the ratchet is working.

4.1.8 Operate any excess fuel device. These take many forms but are typically a lever or slider linked by a spring assembly to the fuel pump, careful examination of which will usually be sufficient to identify it and determine how it works. The device is usually held in its actuated position by a shallow notch, or similar, and returns automatically to its running position once the engine starts.

4.1.9 Activate the decompressor(s). Hold the starting handle correctly (i.e. thumb on the same side of the handle as the fingers), turn slowly a few times to get lubricating oil circulating, then wind more vigorously, building up momentum before "dropping in" (releasing) the decompressor(s) without stopping winding. On multi-cylinder engines it is often best to drop the decompressors in one at a time and, though usually linked when new, the linking bar will usually be found to have been split to make this possible.

4.1.10 If the engine has not started within a reasonable time, investigate the problem.

4.1.11 If the starting handle stays on, spinning quickly, get smartly out of the way and stop the engine by any means possible without getting in he handle's potential flight path. Under no circumstances try to grab it.

4.1.12 **Diesel engines are stopped** by cutting off the fuel supply, not, as is widely believed, by use of the decompressor(s), an exercise likely to result in bent valve stems and an irate plant manager. Cutting off the fuel usually involves pushing the throttle further back than its normal tick-over position and holding it until the engine has completely stopped. As with the excess fuel device, the exact operation of the fuel cut-off is usually obvious from an inspection of the fuel pump if instructions are not available.

4.2 Petrol Engines

4.2.1 These are much less robust than diesels and require more care. Most of the engines you are likely to encounter will be single-cylinder, two-stroke units which run on petrol/oil mixtures. Problems likely to be experienced are failure of the HT (high tension) electrics (the power to the spark plug), oiling or sooting of the plug and flooding with, or starvation of, fuel as a result of carburettor faults. Some engines, particularly the US-made *Briggs & Stratton* ones, have very simple carburettors which can become temperamental as they age.

4.2.2 **Some basic safety points:** Petrol is both much more flammable and much more volatile than diesel oil. Its vapour is also heavier than air and can spread considerable distances before being diluted to safe concentrations. Consequently, never smoke near petrol-engined plant and never refuel a petrol-engined machine while the engine is hot.

4.2.3 **Routine maintenance** is basically the same as for diesels but check also the electrics. A water-repelling spray (such as WD-40™) is an essential maintenance item.

4.2.4 **Starting** is, again, best accomplished by following the instruction manual, if available. If not, try the following:

Almost all petrol engines found on small plant are rope start. Some have "captive" starting strings but most are the "lace it up yourself" type. A length of rope 5-8mm in diameter with a large knot at one end is placed through the slot of a slotted capstan attached to the end of the crankshaft, with the knot inside the capstan. The rope is then wound tightly in the right direction (obvious from the shape of the slot) around the capstan and, once fully wound, pulled sharply, spinning the engine. Do not wrap the starter cord round your hand/wrist; if a unit back-fires you may not be amused. Now put the string somewhere safe!

4.2.5 The most common reasons for the failure of petrol engines to start are:

- Fuel tank empty
- Fuel not turned on (rotary or push-pull tap, usually under the fuel tank)
- Choke not activated (if cold) or activated unnecessarily (if hot)
- Spark-plug still shorted out by the stop switch (see below if this isn't clear)

– so check these before you even try pulling the string!

4.2.6 If you still don't have any success check for:

- Wet electrics (remove, wipe dry and/or apply the aforementioned WD40™)
- Water or dirt in the fuel
- Dirty/wet spark plug (remove and clean/dry)

4.2.7 If all else fails, go and hire a diesel-engined equivalent.

4.2.8 There are two basic ways of **stopping a petrol engine**. The first – more appropriate for short stops than long – is to short the spark plug to earth. Many small units come fitted with a "switch" – often no more than a strip of spring steel attached to the cylinder head – for just such a purpose. Although effective, this leaves the carburettor full and the fuel line open to the tank. Consequently, in the event of a leak, there is a significant risk of fire.

4.2.9 The second – recommended for overnight stops – is to turn off the fuel supply at the main tap, allowing the engine to stop by running out of fuel. This takes a few minutes but leaves the fuel line closed and carburettor substantially empty and minimises any fire risks. It also prevents the evaporation of the more volatile components from the mixture in the carburettor, making starting easier next time round.

4.3 Refuelling (Petrol and Diesel)

4.3.1 Refuel each evening, if possible. This gives any debris stirred up by the operation time to settle before it can be carried into the carburettor/injector pump, helps prevent condensation forming overnight in the tank and reduces the chances of losing working time waiting for the engine to cool when you run out half way through a session. If your machine won't run for a full day on one tankful, top it up after breaks; this at least saves the cooling time.

4.3.2 Refuelling should be carried out away from the working area. Containers should be clearly marked with their contents. Diesel oil in petrol engines simply doesn't work and has to be cleaned out, wasting time but presenting few risks. Petrol in diesel engines is dangerous, at worst leading to explosive self-destruction of the engine. It should also be noted that the requirements of petrol engines can be complex. Four-stroke engines may require leaded or unleaded fuel and two-stroke mixtures vary from about 6:1 (petrol:oil) to 25:1. Make sure you know what fuel your machine requires and use it.

4.3.3 When refuelling from a drum, make sure that none of the rubbish that inevitably collects in the bottom gets into the tank, firstly by using a funnel with a fine gauze filter (also helps prevent spillage) and secondly by not emptying the drum completely. Use the dregs for fire-lighting; if you have no fires to light, put all the similar dregs (don't mix fuels) into one drum, carefully decanting off the good stuff after allowing it to settle.

4.3.4 When fuelling machines, only use old drinks containers as a last resort. Red diesel looks remarkably like blackcurrant drink but tastes quite different. If you have to use a drink container, empty it and then burn or otherwise destroy safely.

4.4 Electrical Power (including Generators)

4.4.1 It is rare for mains power to be available on site; if so, it will probably be 415V, 3-phase. Leave this to a qualified electrician.

4.4.2 Electrical power is usually obtained from a **mobile generator**. Small ones (up to about 2 kVA) are usually petrol-engined and contained within a tubular frame for two-man carrying. Larger ones are usually diesel-powered and wheeled. Most provide both 240V and 110V though, for safety, all plant used on site should operate on 110V, if possible wired 50/0/55V.

4.4.3 To minimise problems, **cables** usually have industrial terminations (all right, plugs and sockets) which are colour-coded. Yellow = 110V; blue = 240V. They are known as either "C form" or BS4343). Different voltage connectors are deliberately designed not to fit each other so don't try to make them do so! When setting up, make sure your cable is adequately sized for the electrical current you expect to use. Remember that what will take a lot will take a little and that inadequate cables have caused many an elusive problem.

4.4.4 The most common electrically-powered items of plant are demolition hammers (aka breakers) and small mixers, though there are also a few electrically-operated pumps and barrow-hoists around. **Starting and stopping** them is usually just a matter of turning a rotary switch.

5. PLANT FOR LIFTING, LOADING & MOVING

5.1 Skid-Steer Loaders

5.1.1 General Description and Preparation for Use

5.1.1.1 Skid-steers are loading shovels, not excavators; most can also be fitted with pallet-forks to provide a basic fork-lift facility. They are designed to operate in flat builders' yards, not on rough sites, having poor ground clearance and less than brilliant stability on rough terrain. Moreover, they don't dig holes very well and landscaping must be done backwards as their tyres make a mess. If that leaves you wondering why they are worth having at all, they are highly manoeuvrable, versatile machines and can be worth their (not inconsiderable) weight in gold on a suitable site. Being narrow, they are particularly valuable for towpath work.

5.1.1.2 The Operators Manual should be available. Read it.

5.1.1.3 The main pre-operational checks on skid-steers, in addition to the engine checks already mentioned are:

- Hydraulic fluid level (don't let hydraulic pumps run dry. The oil acts as both lubricant and coolant so a dry pump quickly self-destructs. *Case* machines use engine oil plus a special additive)

- Check also that the hydraulic hoses are properly connected or (if using forks) the couplings protected with proper bungs
- Brake and clutch fluid levels (if they have a brake or clutch)
- Ensure that, when released, all control levers return to their natural positions
- Tyres (check for general wear and especially for bricks, etc, stuck between the tyres and chassis as they will quickly shred the tyres)
- The Roll Over Protection System
- The counterweights (on the back of the machine. Make sure they're there)
- Bucket pins and teeth (if fitted)
- Grease all nipples every 10 working hours or before leaving the machine unused for an extended period (beware of the exhaust if it is hot)

5.1.1.4 Switching between bucket and pallet-fork operation involves the removal and replacement of pivot pins and hydraulic hoses and is a heavy, two-man task. Care with your thumbs!

5.1.2 Controls

Familiarise yourself with these before using them for real. All skid-steers, being diesel-hydraulic, have hand throttles and are then controlled by variable-displacement hydraulic valves. Most (probably all) have a pair of hand-operated levels, either side of the driver, forward/back movements of which produce corresponding movements of the equivalent wheels. Side-to-side movements usually control other functions (typically raising/lowering of the arms and in/out rotation of the bucket) but these vary somewhat from machine to machine. Opening of the four-in-one type of bucket is usually effected by a foot pedal.

5.1.3 Operating Techniques

5.1.3.1 Always leave the machine with the bucket on the ground when unattended and never step out of the cab with the bucket up or allow anyone to walk under the raised bucket, even with the engine off. Gravity never switches off so it can still fall and crush you/them if a lever is accidentally caught or a hose damaged.

5.1.3.2 For the same reason, always prop the arms if it is necessary to work on a raised bucket.

5.1.3.3 Do not enter or leave the machine while the engine is running. It is all too easy to catch a control with an arm or item of clothing – with unpredictable, but probably unpleasant results.

5.1.3.4 Always use the safety belt. As well as contributing to your safety in the event of an accident, it gives you better control because you don't bounce around the cab as much.

5.1.3.5 Set the engine speed appropriate – just fast enough for what you want to do.

5.1.3.6 Make gentle moves. Skid-steers will turn in their own length but doing so should be avoided unless absolutely necessary. It makes a mess of both the ground and the tyres.

5.1.3.7 As already mentioned, skid-steers are not naturally the most stable items of plant. Good driving is, therefore, largely about maximising machine stability. Thus:

- Always keep your load as low as possible
- Beware hills and side slopes. Even more importantly than with other items of plant, tackle hills square-on, perhaps going backwards UP hills if unladen
- Consider the effect that tipping your load is likely to have on the stability of your vehicle before actually doing it
- Be aware that the angle of the bucket changes with elevation, as does visibility

5.1.3.8 Other sensible points, in no particular order, include:

- In the event of losing control, simply release all levers and stay in the vehicle. The ROPS will protect you
- Hydraulic valves sometimes do not close completely so beware of creepage of the travel motors. Apply the brake, though, as this often works on one side only, your machine may simply execute a slow pirouette instead of a straight crawl
- Don't leave the machine on a slope without proper chocks
- When shovelling, keep the base of the pile neat and flat
- Sheet loads if windy and dusty
- Beware when tipping into trenches as your front wheels are very close to the bucket. Use a stop board to avoid falling in
- Be careful if using a loader to lift items using chains or strops, in particular beware of cutting strops, etc on sharp edges on the bucket
- Always wear ear defenders; add goggles when working in dusty conditions

5.2 Dumpers

5.2.1 General Description and Preparation for Use

5.2.1.1 Anyone reading this Handbook is likely to be familiar with the general concept of dumpers. What they might be unaware of is that they come in three basic forms:

- Rigid chassis with rear-wheel steering (2- or 4-wheel drive)
- Articulated chassis (usually 4-wheel drive), and
- Rigid chassis with rear tipping

5.2.1.2 The first of these is the traditional, builders' dumper, usually with a single cylinder, air-cooled, diesel engine (see 3.1), mechanical drive, a 15cwt (750Kg) payload and manual tipping. WRG owns a number of these and individual canal societies have others; they are also widely available from hire companies, as are larger machines with multi-cylinder engines and hydraulic tipping.

5.2.1.3 The second is the modern, contractors' dumper, usually available in 2, 3 and 5 tonne versions from hire firms. They have three- or four-cylinder, water-cooled engines and electric start. Tipping is invariably hydraulic.

5.2.1.4 Rear-tipping dumpers are the huge long things seen on major road-building sites but a fairly recent addition to the canal restoration scene, albeit a predictable one as the scale of earth-moving on canal restorations increases. These resemble nothing so much as very large tipper lorries and that, in effect, is what they are – with all-wheel drive. They start at about 10 tonnes payload and go up!

5.2.1.5 These three types of machines have quite different handling characteristics. Be careful the first time you use each type and familiarise yourself with its handling on a large, open area before heading off down a narrow towpath.

5.2.1.6 There are also a few 'specials' such as swivel-skip machines (rigid chassis machines with small, high-set skips which rotate and will tip up to 90° either side of straight ahead).

5.2.1.7 The main pre-operational checks on dumpers, in addition to the engine checks already mentioned, are:

- Hydraulic fluid level (don't let hydraulic pumps run dry. The oil acts as both lubricant and coolant so a dry pump quickly self-destructs)
- Brake and clutch fluid levels
- Ensure that, when released, all control levers return to their neutral positions
- If applicable, go round all the grease nipples with a grease gun

5.2.2 Loading

5.2.2.1 During loading the machine should be properly braked and, if on a slope, chocked. The engine should be stopped and the driver off the machine. (Time for a brew!). If this seems pedantic, remember that a stray stone/brick/clod of earth can be enough to knock a machine into gear with potentially interesting results.

5.2.2.2 Positioning for loading is a juggling act between the respective machine drivers. Normally this presents few problems after a bit of practice but remember that you are responsible for the machine you are driving.

5.2.2.3 If the loading shovel is wider than the dumper's skip, try putting two dumpers side by side or nose to nose to reduce the amount spilt.

5.2.2.4 Do not overload the dumper with materials – very easily done with mechanised loading. Any time saved in a reduced number of journeys may well be lost by having to remove part of each load with shovels before the bucket will tip.

5.2.2.5 Don't overload the dumper with strange shaped loads – if the load won't sit in the skip ensure it is safely fixed, but if tying it down make sure it does not foul the steering system, brake rods, hydraulic pipes or the tip lever.

5.2.2.6 Be aware of debris build-up around the (foot) controls and keep the driving area as free as possible. A stone jamming under the brake pedal could provide some unwanted entertainment.

5.2.3 Controls

5.2.3.1 The gears are usually

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1          3
| ----- N -----|
R          2
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on older, rigid-chassis models – but 1st and 3rd are sometimes reversed

5.2.3.2 Newer, hire machines usually have four-speed gear boxes and separate forward-reverse controls. Some even have electro-hydraulic drivers that render the clutch redundant other than for emergency use. With these, however, beware of the vehicle's moving off immediately you select a gear in the main box because it is already in forward or reverse. You don't need to touch the clutch. The gear positions are usually well marked. Beware also that some new machines have interlocks fitted between the clutch and the starter – bizarrely some will only start if the clutch is depressed while some will only start if it is not.

5.2.4 Driving

5.2.4.1 When returning from a break it is a good idea to walk right round the machine to ensure that no-one has fallen asleep in its shade.

5.2.4.2 On 3-speed machines you will usually find 2nd gear adequate for most driving, whether laden or unladen. Use 1st for slow-speed manoeuvring and climbing/descending slopes, 3rd for driving unladen to and from the storage compound. On 4-speed machines read 2nd and 3rd for 2nd, and 4th for 3rd. Never use the clutch pedal as a foot rest.

5.2.4.3 Try not to drive with your fingers right round the steering wheel. If the machine finds a hole and the steering kicks your hands may suffer.

5.2.4.4 Let the engine do the major braking when descending slopes, etc. resist the temptation to put your foot on the clutch.

5.2.4.5 Think where the centre of gravity is and make sure that it is as far inside the wheel base as possible, bearing in mind that it will change depending on whether your dumper is loaded or not and whether you are going up or down hill. Tackle slopes square-on to minimise any sideways lean. Always use the engine for braking when descending hills. If you need to drive backwards to maximise stability, so be it.

5.2.4.6 Going through mud is best done in as straight a line as possible. This is very important with the smaller, 2-wheel drive machines where the rear, steering, wheels often tend to drag rather than steer. If you bog a machine down and can't drive it out then try winding it. Put it into gear and, with the decompressor(s) operated (very important – if you manage to turn it over without, the machine might start), wind it out slowly with the starting handle. This technique is not guaranteed but has quite a high success rate and is well worth a try.

5.2.4.7 If you meet ruts and your machine does not fit them, drive far enough to one side for one pair of wheels to run in a rut with the other pair on the top of the hump between them – or even further to one side so that one pair is beyond the rut and the other on the hump.

5.2.4.8 When preparing to go along relatively narrow embankments, stop and get off the machine to check your position (if in convoy with a similar machine, observe it) and be aware that vegetation can obscure what is there. Ditches and edges are easily missed. If you need to pass walkers on a narrow path the safest way is to stop your machine and let them pass you.

5.2.4.9 If you can't see properly over a load, drive backwards.

5.2.4.10 On a windy day if the load (or road) is dusty you may well require goggles.

5.2.4.11 Black smoke is usually a sign of excess fuel and is a common fault. The proper solution is to get the injector(s) serviced. Until this can be arranged, driving gentle, pressing the accelerator down slowly and progressively as your speed increases, will help.

5.2.4.12 Most dumpers are not licensed for use on public roads. These carry no license plate but the presence of a number plate does not necessarily mean that the dumper is road legal. Others are limited to short distances on the highway, e.g. crossing a road between parts of a site. Check the legal arrangements with the site leader.

5.2.5 Tipping

5.2.5.1 Tip in as straight and level a line as possible. When tipping near/over an edge, put down a couple of blocks (railway sleepers are ideal) as stop boards for the front wheels. If the ground is too soft to peg them securely, try attaching them to a couple of lengths of chain pinned to some secure ground behind you.

5.2.5.2 Remember that a dumper's centre of gravity moves significantly as the skip rises. This is important on rigid chassis machines, more so on articulated ones and extremely so on the swivel skip ones that are making an appearance on an increasing number of sites. That amount of load, that high up, can be interesting. And, as for tipping on a downward slope. . .

5.2.5.3 When driving in the tipping area, beware of sharp things like reinforcing bar sticking up. A puncture is a nuisance at the best of times; on an unstable tip it can be a major problem.

5.2.5.4 Keep an eye on crud build-up in the skip. It may need shovel work now and again.

5.2.5.5 Don't use the skip as a bulldozer.

5.2.6 Towing

5.2.6.1 Their ability to cope with heavy site conditions makes dumpers favoured vehicles for towing unpowered plant such as pumps and compressors. However, there can be problems.

5.2.6.2 Tow very carefully, especially when using the smaller dumpers which only have brakes on one end, usually the driving (front) wheels. Be particularly careful when towing mixers or other narrow-chassied machines because they are prone to fall over, especially on rutted tracks. Try having someone walking behind watching from a safe distance.

5.2.6.3 Think carefully before stopping the engine. Your tow may prevent access to the engine with the starting handle.

5.2.6.4 If you have to tow the machine out of a hole ensure that the tow rope does not catch any brake rods or any pipework, and that it is protected round any sharp edges.

5.2.7 Parking

5.2.7.1 When parking a hand-start machine, don't reverse it up to a wall, or similar. It might look tidy but makes inserting the starting handle more fun than you really want.

5.2.7.2 When parking an electric-start machine, think about the possible need to jump start it next time, much more likely on an intermittently-used machine than one used regularly. Remove the keys if there is any chance of unauthorised people getting access to the machine.

5.2.7.3 When parking a dumper fitted with hydraulics, leave the minimum of chrome showing on the rams; it reduces corrosion and extends the life of the ram.

5.2.7.4 Don't leave parked dumpers in gear; they could accidentally be bump started.

5.2.7.5 Do not go under a raised skip unless it is carefully blocked. The manual unit will normally try to roll back on its own. A hydraulic unit may well fall back if someone moves the lever (with or without the engine running) or you accidentally sever the pipe.

6. PLANT FOR LOCK CLEARANCE

6.1 Barrow Hoists

6.1.1 General Description

6.1.1.1 A barrow hoist is basically a small, portable (joking!) crane designed to mount either directly on scaffolding or on an (equally portable) independent stand. There are two basic variants.

6.1.1.2 In the older type, exemplified by those made by *Ace* and *Saga*, a cable, fixed at its inner end to a winding drum, passes over a pulley near the end of a 6-8' jib, through a pulley block carrying the lifting hook and is then fixed back to the jib. It is wound in/let out by means of an engine, usually petrol-powered, occasionally diesel or electric, which drives the drum *via* a clutch/brake assembly. The independent stands are usually large steel tripods or pyramids, supporting vertical "masts" on which the motor/drum/jib

assembly mounts. *Ace*'s jibs are detachable from the motor; *Saga*'s are permanently linked.

6.1.1.3 Modern hoists resemble miniature overhead cranes, having a gantry and an electric motor. Although much quieter than the old type, most require the operator to reach out into space both to use the operating level and to load/recover barrows. A few have pendant controls but still present difficulties with barrow handling. Concern has been expressed about the safety of this type of hoist but they are widely used by the building trade without obvious problems and are what you will get if you hire one.

6.1.1.4 Beware the potential build-up of exhaust fumes in a lock chamber.

6.1.2 Setting Up

6.1.2.1 At all times when working near the top of a lock, don't forget the drop – it's a long way down!

6.1.2.2 You don't have a lot of choice of site; it has to be one or other edge of the lock you want to clear, preferably the one where you are going to tip the sh*t that comes out. That said, a horizontal flat area, free of debris and undergrowth and with adequate working space (say a minimum of 8') around, is highly desirable and contributes greatly to safety and ease of operation. For reasons associated with water control in the lock it is usually best to site the hoist close to the bottom gate recess on your chosen side.

6.1.2.3 Ensure that there is a solid section of wall below you, without overhangs – and a good barrow run. Pushing the first barrow of the day on a firm, level surface is easy: pushing the four hundredth up a by now soft and slippery slope can be seriously hard work. Emptying barrows is the most physically demanding job in canal restoration so time spent preparing the barrow run is time well spent.

6.1.2.4 If you need to carry a hoist any significant distance two methods are available. The first is to put the motor unit in a barrow; this is straightforward with an *Ace*, less so with a *Saga*, a second person being needed to steady the jib. The second is to mount the motor unit temporarily on two lengths of scaffolding, making it a four-man carry. Either way, beware of spilling fuel. Moving the rest of the kit is just a straightforward, if rather heavy, carry.

6.1.2.5 Take care during erection; the bits are heavy and awkward and need to be aligned quite accurately to slot together. Make free with the grease and oil.

6.1.2.6 The mast must be vertical and the front of the base 4 to 6" (100-150mm) from the edge of the lock. Do not use bricks for levelling - they tend to crumble at just the wrong moment, as do the softer types of stone. If possible, level the site by digging out/infilling the back of the area to level with the top of the coping stones. Otherwise, use the minimum number of large pieces of timber under the stand. Once erected, put plenty of weight on the back of the frame to counterbalance the load, making sure it won't fall off if anything moves. Concrete blocks – the solid type – are ideal but stones, steel or even heavy timbers such as railway sleepers are fine. The 'gantry' type usually

come with fitted weight boxes and purpose-made weights. Keep an eye on the solidity of the base throughout operations; if it starts to rock, re-pack as necessary.

6.1.2.7 Jib angles are adjustable by means of bolts through alternative sets of holes. The middle setting is usual. It is, however, a trade-off. The lower the jib, the further the barrow hangs from the lock wall and the easier it is to raise/lower. However, it also hangs lower when fully raised and is thus harder to swing for landing. Rig very carefully with the engine stopped, oiling any moving parts. Then run the hook slowly down and back a few times to make sure everything is working correctly and that the cable is long enough. When fully extended there should still be three full turns of cable on the drum. Repeat this "down and up" test with a half load and then a full load with everyone well out of the way. If there are any problems, snagging on the chamber wall, rocking of the base, etc. then stop and solve the problem. Wear strong gloves when handling wire rope.

6.1.2.8 When you've completed the above and are ready to start the hoist, get someone to hold the jib when you pull the starter cord – to stop it swinging round.

6.1.2.9 With electric units ensure there is enough cable for unhindered swinging but not so much as to be a trip hazard. Protect the cable well if the barrow run crosses it.

6.1.2.10 There should be two personal accesses to the lock. If ladders are used they should be at an angle of 70° and project not less than 3' 6" above the landing. They should also be securely lashed, not only to something solid to stop them falling over but to each other if of an extension type because these come apart rather easily when manoeuvred from above.

6.1.3 Using the Hoist

6.1.3.1 Because this is a lifting machine the operator must have reached the grand old age of 21 – as should anyone connecting the load.

6.1.3.2 Hoists are not to be used as man lifts.

6.1.3.3 Barrows are suspended from hoists by purpose-made chain sets, comprising two chains of equal length terminating in rings about 2" (50mm) in diameter and a longer one terminating in a 'pigtail', all joined to a large ring which clips into the hook of the hoist. The 2" rings are first slipped right down over the barrow handles so that the chains pass outside the rear of the body; the pigtail then slips round the barrow frame (either side) in front of the axle and its chain rests over the front of the body. Do not shorten chains by knotting; they will be damaged. If they appear to be too long there is probably another reason. Find out what it is.

6.1.3.4 These machines are operated by a single lever (*Saga*) or linked pair of levers (*Ace*). In both, the method of operation is that the winding drum is automatically braked in the "At Rest" position (lever/s released) and both thus fail "safe". At the opposite end of the lever's travel (against a spring) the drive is engaged. In the middle is a freewheel position. Controlled lowering is achieved by balancing freewheeling and braking. Never try to balance (slip) the drive to hold a load stationary.

6.1.3.5 Once the first barrow is attached, it is ready to be lowered into the lock. Lift it a few inches, taking care that the pigtail doesn't slip, swing it over the edge of the lock, keeping it parallel with the side, and lower it steadily until it is 2-3' above the surface of the infil. Then stop and lower it very gently until it reaches the surface. In the early stages of a clearance, when the surface may be very uneven, it may be helpful to keep the barrow suspended a couple of inches above it. This makes loading easier by keeping the barrow level and prevents the pigtail's slipping by keeping it under tension. Before slewing the unit round check that nobody or nothing is likely to be knocked into the chamber. If you have to wait before lowering a barrow, keep the empty barrow slewed over the land rather than space.

6.1.3.6 Lifting a loaded barrow is straightforward but requires care. In particular, the lie of the chains and the fit of the pigtail must be checked and, if necessary, corrected. Then, any slack in the cable and/or chains must be taken in carefully to avoid slippage of the pigtail. The most common problems with barrow hoists are the incorrect fitting of the chains and/or slippage of the pigtail. Either can lead to the potentially dangerous spilling of the load. Like lowering, lifting should be done with the barrow parallel to the lock wall to reduce the chances of its catching. There is usually little to spare on height so you must be ready to stop quickly when the pulley block is 1-2" from the jib. Letting go of the control lever is all that is required but this is counter instinctive so takes a little getting used to. Keep both cable and chains untwisted. Either can lead to difficulty controlling the raising/lowering of barrows and may prevent their being lifted high enough to land at the top.

6.1.3.7 The *Saga* unit has only one control handle so offers little choice of technique; on the *Ace*, however, it is usually easier to take up slack using the front handle (better view) and then use the rear one for the actual lift (more leverage). Lowering is more easily controlled using the front one. Electrical units, particularly those without pendant controls, are to be treated with care. Most only fail safe when the block reaches the top.

6.1.3.8 All lifting and lowering should be done with the cable vertical. Barrows loaded some way along the chamber should be pushed to directly below the hoist before being lifted. It is debatable whether it is better to move the hoist along the lock side and keep altering the barrow run or leave the hoist in one place and have more than one barrow at the bottom at any one time. A combination of the two is probably the most common solution.

6.1.3.9 Hoists are designed to lift only 5 cwt (*ca* 250Kg). This includes the block, chains and barrow, not just the spoil removed. They should not be overloaded by, for example, trying to lift half-buried bits of metalwork or gate timbers.

6.1.3.10 If you run out of fuel while lifting a full barrow, do not panic. Simply release the control lever, braking the load; then lower it gently back into the chamber.

6.1.4 Ancillary Operations

6.1.4.1 Much of the skill of lock clearance lies in good hoist operating and working as a team. Slick barrow changing can easily halve the time taken to empty a lock. They key is always to use two people to switch the chains between barrows so that they are always

held and cannot tangle. If incorporated into the barrow-run cycle, helping the hoist operator do this can afford welcome, regular 'breathers'. If the site permits, the optimum technique is to 'land' the full barrow alongside the empty one, the helper removing the pigtail first, followed by the operator removing the rings, these actions then being reversed when putting the chains onto the empty barrow.

6.1.4.2 The physical demands of the barrow-run have already been mentioned. The following tips may help.

- Use pneumatic – rather than solid-tyred barrows and keep the tyres well pumped up. This makes them much easier to push
- Remove debris from between the wheel and the body. Otherwise, it's like pushing a vehicle with the brakes on
- Load most of the weight at the front of the barrow. The wheel then carries most of it rather than the arms of the poor sod who is pushing
- If the barrow run ends in a distinct edge, e.g. tipping from a platform into a dumper, use a heavy block to tip against and thus avoid running off the edge.

6.1.4.3 As regards the actual digging, the key is to get down to the invert (bottom) in one place as quickly as possible and then shovel off the invert. This is much quicker and easier than attacking the top along a whole length. Pull down compacted material with a mattock onto the invert ready for shovelling. Once you get to the invert and start moving along, you may need to use two or more barrows at the bottom. Slick changeovers are again important, the best way being to position the full barrow directly below the hoist and next to the wall, guiding the descending empty one to the outside of the loaded one, using shovels. Two people then swap the chains while a third takes the empty for loading. Meanwhile, if four shovellers re-load their shovels during the changeover, they will be halfway to filling the next barrow.

6.1.4.4 Depending on the nature of the spoil it may well slump overnight and so the following day it will appear that you have lost ground. You haven't and you will quickly pass where you left off the night before. It's just a bit disheartening.

6.1.4.5 As far as is practicable, keep clear of any lifting operations.

6.1.4.6 The invert usually (but not always) has a shallow U-section. Consequently, if you need to walk along a flooded chamber, try walking along the edges. They should be shallower, at least until you get to the gate recesses. It should be noted, however, that the standard depth of water on any restoration site is always wellie plus 1".

6.1.4.7 Stones are heavier than you think. One method of loading them into barrows is to put the barrow on its side, then roll the stone into it before carefully righting the barrow and centralising the stone over the wheel. Make sure the barrow has a well inflated tyre; soft ones tend to pop off the rim. Once you have loaded your barrow with stone don't fill up the barrow with sludge. It will be heavy enough as it is.

6.1.4.8 There is nothing to say that everything coming out of a lock must be in a wheelbarrow. If it makes sense, use just the chains – or ropes, or any other safe means ('stone tongs' are specially designed for lifting large stones) to secure the load. But do make sure it is secure and work out how you are going to handle it at the top before it gets there.

7. MISCELLANEOUS PLANT

7.1 Tractors (including tractor-mounted winches)

7.1.1. General Description and Preparation for Use

7.1.1.1 Tractors come in all shapes and sizes, from small 'Garden' types to monster, truck-sized beasts. Most are diesel-powered, though there are other types, notably Petrol and TVO (Tractor Vapourising Oil – a form of paraffin – now largely obsolete).

7.1.1.2 One of their main claims to fame is that they are usually fitted with Power Take-Offs (PTO's) so are capable of driving a range of ancillary equipment. This makes them useful for many tasks including:

- Towing graders
- Heavy rolling
- Grass cutting
- Hedge trimming
- Winching

7.1.1.3 Their other main advantage over other pieces of plant is that they can be used both on and off the road, including towing over short distances.

7.1.1.4 The main pre-operational checks on tractors, in addition to those already mentioned, are:

- Hydraulic fluid level (see 3.1.1 for description of the results of not doing)
- Brake and clutch fluid levels
- Ensure that, when released, all control levers return to their neutral positions
- If applicable, go round all the grease nipples with a grease gun

7.1.1.5 **Notes**

- The stop control may be on the key switch or, more likely, a manual "pull to stop" knob/cable
- Before starting, make sure the tractor is not only out of gear but that the PTO is disengaged
- Cold starting could involve either an excess fuel device or electrical pre-heaters (usually controlled by the key switch) or possibly both
- Always fully depress clutch and hold down whilst engaging starter.

7.1.2 In Use

7.1.2.1 While operating the tractor ensure adequate room is available between the machinery and other workers. Do not rely on others to "get out of the way"!

7.1.2.2 Great care should be taken on uneven and sloping ground, especially when loaded.

7.1.2.3 You will probably find two gear levers. One of these will operate the standard gearbox, whilst the other operates the High/Low transfer box, effectively giving you two sets of gears. It is important to note that most tractors do not have synchro-mesh. Therefore, unless you are uncommonly good at double de-clutching, you should not attempt to change gear whilst the tractor is in motion. When selecting a gear it is important not to overload the engine. An easy check for this is to open the throttle, if the engine picks up speed quickly there is no problem, if the engine does not respond it is overloaded and a lower gear should be selected.

7.1.2.4 There will usually be a method for braking each side of the tractor individually thus enabling a far tighter turning circle when working in restricted areas, this facility should not be used at anything above a "crawl" speed. This may be either twin brake pedals linked together with a clip, or one main and two additional brake pedals. If it is of the former type ensure the clip links the pedals together securely.

7.1.2.5 It is important to note that tractor brakes are not usually as efficient as those on cars, etc. Since most tractors weigh over two tons and the brakes are usually not power-assisted, caution should be the watchword. A rule of thumb when driving a tractor on the flat is that if you need brakes you are probably going too fast. (See also Parking.)

7.1.3 Power Take Off and Hydraulics

7.1.3.1 There are several different types of PTO but the only one likely to be encountered is the splined shaft at the rear of the tractor. This is used to provide rotary power to implements. It can be used whilst the tractor is mobile or stationary. It is important, nay, obligatory that the PTO and all associated shafts are properly guarded!

7.1.3.2 Hydraulics operate such attachments as fore end loaders, hedge cutting equipment, light excavating equipment and other implements fitted to the rear three point linkage.

7.1.4 Mounting Implements

Implements will either be mounted on the three point linkage or attached to the towing hitch, it is extremely dangerous to tow from the top of the three point linkage. Ensure that all three point linkage equipment is mounted correctly prior to use. If a pin hitch is being used for towing ensure the pin in use is adequate for the job.

7.1.5 Parking

You should not rely on the parking brake to keep the tractor from rolling away. If a mounted implement or fore-end loader is being used, lower it completely to the ground. As well as the usual safety reasons for doing this, it will also act as a second brake. If the tractor MUST be left on a slope and there is no implement or fore-end loader fitted, always chock the wheels.

APPENDIX 1 – ADDRESSES

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APPENDIX 2 – WRG PLANT LIST

So what plant does WRG actually have? This list represents a snapshot in time of the wrg plant fleet and is only included to show the fact that at anyone time only about 75% is working and most of that is on long-term loan. However, if it is available then you can have loan of it for the cost of transport, maintenance and consumables. The list was undoubtedly out of date when it was printed so please contact the WRG Plant Managers for further details.

WRG Plant List as at 1st December 1997

CLASS'N	CODE	DESCRIPTION	REG'N NO.	LOCATION	SINCE	AVAILABILITY
Air Equip't	A 1	Compair/Ford 2 Tool Compressor		Worcester	09/09/93	IW
Air Equip't	A 2	Williams & James Static Compressor		NCCC	02/05/88	AV (on loan from AG)
Air Equip't	A 3	CP9 Air Hammer (small)		Mansfield	??/??/94	
Air Equip't	A 4	CP117 Air Hammer (large)		Mansfield	??/??/94	
Air Equip't	A 5	Poker/Vibrator		Mansfield	??/??/94	
Air Equip't	A 6	Air Drill		Mansfield	??/??/94	
Air Equip't	A 7	Air Hammer (large)		Mansfield	??/??/94	
Air Equip't	A 9	Poker/Vibrator		NCCC	10/12/94	AV
Boat	B 1	Work Punt, 34'	BWB 74422	Aston	16/07/89	LT
Boat	B 2	Aluminium Pontoon, 17' 6"		Droitwich	21/12/36	L) Not to be
	B 3	Aluminium Pontoon, 17' 6"		Droitwich	16/02/83	L) separated
Dumper	D1	Winget 2S, 15cwt		Grantham	??/05/96	L
Dumper	D2	Winget 2S, 15cwt	GKX 206 Y	Sankey	??/??/97	L
Dumper	D 6	Winget 2S, 15cwt	MMA 897 L	Boxwell Springs	09/02/93	L
Dumper	D 7	Winget 2S, 15cwt	Q 742 FLD	Wilts & Berks	12/08/89	L
Dumper	D 8	Benford, 15cwt		Langley Mill	??/11/79	LT
Dumper	D 9	Bonsor, 15cwt		Langley Mill	??/??/87	L
Dumper	D10	Bonsor, 15cwt		Chesterfield	10/10/87	L (non-standard colour)
Dumper	D11	Benford 750, 15cwt		Elsecar Basin	23/0B/90	AV (in use till wanted)
Dumper	D12	Benford 750, 15cwt		Sankey	??/??/97	L
Excavator	E 2	JCB C2	CWT 167 H	NCCC	15/12/94	IW
Excavator	E 3	Smalley 5, Mk.2, with winch		Stockport	22/11/90	BD (needs a lot of work)
Excavator	E5	Smalley 5, Mk.3		Wilts & Berks	??/06/89	L
Excavator	E 7	RB3, 360° Excavator		Langley Mill	??/10/79	LT
Excavator	E11	Case 1835B Uniloader		Aston	03/97/88	L
Excavator	E12	JCB 803		Aston	30/04/97	L
Gardening Equip't	G 2	Echo Bruish Cutter		NCCC	22/11/95	AV
Gardening Equip't	G5	Husqvarna G165		NCCC	07/10/97	AV
Lifting Equip't	L1	Tirfor T35, 3 Ton Winch		Test House	13/10/95	BD (a lot of work)
Lifting Equip't	L2	Ace Barrow Hoist		NCCC	05/12/95	AV (to be tested)
Lifting Equip't	L 3	Jones KL15, 15cwt Crane	JXM 31	Elsecar	08/03/94	L

Lifting Equip't	L 5	Saga Barrow Hoist		NCCC	04/06/97	L
Lifting Equip't	L 6	Yale 3 Ton Pull Lift (6' lift)		Northwich	07/06/91	L
Lifting Equip't	L 7	Yale 3 Ton Pull Lift (6' lift)		Northwich	07/06/91	L
Lifting Equip't	L 8	Yale 3 Ton Pull Lift (6' lift)		Stockport	06/01/91	AV
Lifting Equip't	L 9	Yale 3 Ton Pull Lift (6' lift)		Aston	29/06/92	L
Lifting Equip't	L10	Yale 3 Ton Pull Lift (6' lift)		Stockport	06/01/91	BD
Lifting Equip't	L11	Tirfor T35, 3 Ton Winch		Cotswolds	14/04/97	L
Lifting Equip't	L12	Tirfor T35, 3 Ton Winch		Buckingham CS	11/02/96	L
Lifting Equip't	L13	Tirfor T35, 3 Ton Winch		BITM	05/12/95	L
Lifting Equip't	L14	Tirfor		Camps		
Mixer	M 1	Ransoes, 5/3.5		Langley Mill	??/10/79	LT
Mixer	M 3	Small Wheeled		Worcester	29/12/90	IW; DL
Mixer	M 4	Belle Electric, 110V		Grantham	01/04/96	L
Mixer	M 5	Belle Petrol		Diggle	??/10/85	L
Mixer	M 6	Belle Petrol		Wilts & Berks	26/12/88	BD (New Engine Sent)
Mixer	M 7	Liner/Petter		Aston	26/05/91	L
Mixer	M 8	Belle Electric, 100V		Aston	14/06/97	L
Mixer	M 9	Small Wheeled		Macclesfield	13/01/90	L (Macclesfield CS)
Mixer	M10	Johnson/Petter poker		NCCC	07/11/95	BD (drive cable)
Mixer	M11	Stihl TS350 Super, 12" Bricksaw		Aston	16/07/97	L
Pump	P 1	Lister/Sykes 3" Centrifugal		NCCC	04/12/94	AV (detail work req'd
Pump	P 3	2" Centrifugal, Petrol		Stockport	20/04/85	AV (short term)
Pump	P 4	Johnson Mk 18, 3" Petrol		NCCC	07/10/95	AV (minor oil leak)
Pump	P 5	Lister/Johnson Mk4, 3" Sludge		NCCC	21/09/95	AV
Pump	P 6	Lister/Johnson Mk4, 3" Sludge		Wilts & Berks	19/05/95	STOLEN
Pump	P 7	Simplite 2" Sludge, Petrol		NCCC	28/03/97	AV
Pump	P 8	Weda 2" Electrosub, 110V		NCCC	05/11/92	IW (contactor dead)
Pump	P 9	Borehole, 6" 3PH		NCCC	27/02/96	AV
Pump	P10	Lister/Sykes 4" Fast Tow		Wilts & Berks	10/05/05	L
Pump	P11	Lister/Sykes UVC6		NCCC	27/02/96	L (minor work req'd)
Pump	P12	Lister/Sykes UVC4		Hereford & Gloucs	05/07/96	L (minor work req'd)
Pump	P13	Johnson Mk3(?), 3" Sludge		Elsecar	27/07/92	L (minor work req'd)
Pump	P14	Spate/Petter 3"		NCCC	21/02/95	AV
Pump	V 3	SLD. 6" Dri-prime		Aston	03.04.97	L
Pump	V 5	2" Atalanta/Petter		NCCC	??/??/94	AV
Trailer	T 1	Plant Trailer, 16' x 16' Deck		NCCC	07/11/95	BD (to be scrapped?)
Trailer	T 2	Caravan 20" Site Hut		Droitwich	??/09/81	LT
Trailer	T 3	Box Trailer, 5'4" x 8'10", 2 Wheel		NCCC	07/11/95	AV (short term only)
Trailer	T 5	Camps Trailer				
Trailer	T 6	Horse Box Trailer		Aston	??/??/92	BD (to be scrapped?)
Trailer	T 7	16' Mobile Office		NCCC	21/05/91	AV (short term only)
Trailer	T10	Camps Trailer				
Trailer	T11	Bessacar 450 Caravan		NCCC	03/09/95	AV
Workshop Equip't	W3	Gas Welding Set		NCCC	23/03/91	AV (short term only)
Workshop Equip't	W6	Kew Pressure Washer		Aston	07/06/97	L
Workshop Equip't	W8	Generator, 6KVA, 110/240V		Aston	07/06/97	L (short term only)
Workshop Equip't	W10	Pressure Washer 3PH		Droitwich	20/09/87	L

Workshop Equip't	W11	Generator B&S 1kV, 240/110V		NCCC	20/03/94	BD (needs new engine)
Workshop Equip't	W12	Broomwade DD7G-13 Drill, 1/2" chuck		NCCC	11/07/89	AV (fittings)
Workshop Equip't	W13	Broomwade PK3A Grinder		NCCC	11/07/89	AV (needs sorting out)
Workshop Equip't	W14	Broomwade TSH3B Scrabbler		NCCC	11/07/89	AV (needs sorting out)
Workshop Equip't	W15	Broomwade BX7BA Chisel		NCCC	11/07/89	AV (needs sorting out)
Workshop Equip't	W16	Electric Drill 5/16" Chuck, 110V		NCCC	07/11/95	AV
Workshop Equip't	W17	Transformer, 240 > 110V, 500VA		NCCC	31/05/99	AV (short term only)
Workshop Equip't	W18	AEG WS2000S Angle Grinder, 7", 110V		NCCC	01/05/96	STOLEN
Workshop Equip't	W19	Transformer, 240 > 110V, 500VA		NCCC	03/08/89	AV (short term only)
Workshop Equip't	W20	Compair BW1017 Impact Wrench		NCCC	03/08/89	AV (fittings)
Workshop Equip't	W22	Transformer, 240 > 100K, 1kVA		NCCC	15/01/96	AV
Workshop Equip't	W24	Makita 5" Grinder, 110V		NCCC	01/05/96	L (short term only)
Workshop Equip't	W25	B&D 1/2" Drill, 110V		NCCC	01/05/96	L (short term only)
Workshop Equip't	W26	Richmond 6" Bench Grinder		NCCC	02/10/96	AV
Workshop Equip't	W27	Krypton Welder		NCCC	23/09/97	AV