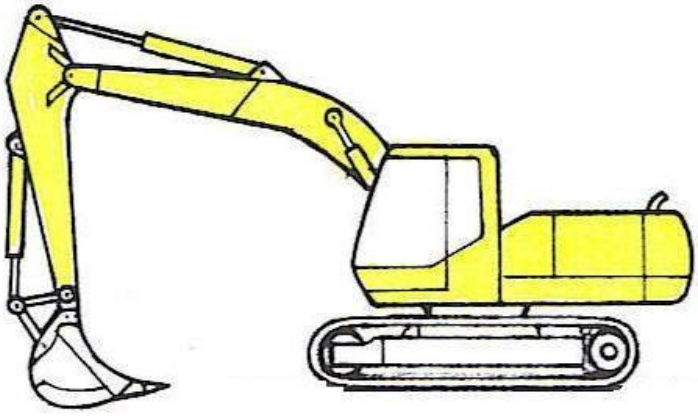
STEPHEN WOOD TRAINING SERVICES LTD

360º Wheeled and Tracked Excavators



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Health and safety at work act 1974 – designed to protect people and the environment from work place activities. It places certain duties and responsibilities on employers, employees, self-employed people, designers and manufactures.

- **Employers' responsibilities** - must ensure workplaces under their control are safe and free from hazards. Ensure the safety of employees, self-employed, visitors, trespassers and the general public who could be affected by the work. Everything they provide for use, tools, plant and equipment must be fit for purpose, safe to use and the personnel trained to use it
- **Employees responsibilities-** must take care of themselves and others who may be affected by their acts or omissions. Co-operate with their employer. Do not tamper with or interfere with or misuse anything provided for safety
- **Failure to comply with legislation-** could result in loss of you job and all the financial implications that can bring but it could also result in prosecution. The severity of the breach of legislation and any accidents or incidents related will dictate what type of court proceedings you could face. If you have fulfilled your legal requirements and can provide proof of this in court, then you would likely be found Not Guilty but If you were found guilty you could face a prison sentence or a substantial fine

To fully understand the above Act specific training and guidance is required

Method Statement- detailed description of how to carry out a job safely and efficiently. All involved in the work must be briefed on its contents. Workers must follow the Method statement unless they feel it is not suitable then they should stop and report it and have the method statement amended. Method Statement must only be amended by competent people

Risk Assessment- is a legal requirement before work starts. It is a detailed assessment of the risk involved in doing and job and provides information on how to reduce the risk level down to an acceptable level.

Hazards- this is anything which can cause harm to people plant or equipment.

- **Excavations or Trenches or Edges–** risk of collapse. The minimum distance to keep away from open excavations is at least the depth of the trench i.e. if its 2m deep you stay 2 m back

- **Sideways rollovers can happen- When the Excavator is driven across steep slope, driving too close to excavations or edges, Working or lifting cross track, Overloading, Lifting full loading buckets at full reach**
- **Working at height-** any place you can fall from and be injured is considered working at height. The top of a mound, climbing into or out of a machine. Standing by the edge of a n excavation
- **Slopes-** wherever possible the weight always faces uphill i.e. empty dumper skips face downhill and loaded
  skips face uphill. Extreme care should be taken if working across a slope. Avoid turning on slopes if possible

- **Overhead cables-** the minimum distance to be maintained form overhead cables mounted on wooden
  poles is 9m from the greatest reach of the machine and 15m from cables on metal pylons. Electricity can arc or jump a gap.

- **Confined spaces-** anywhere there is restriction on operating area can be considered a confined space. There is a greater risk of accident or damage. The Minimum distance which should be maintained between a fixed obstacle and the machine is 600mm (this is deemed to be the smallest distance a person can go through without being injured). if this distance can't be maintained then the area should be fenced off and signs erected. Fumes, dust, noise, lack of visibility and insufficient room to manoeuvre are all hazards

  associated with confined areas
- **Plant operations –** are regarded as "safety Critical operations" because of the potential risk of an accident. Plant Operators can cause harm to themselves or other people if they carry out an unsafe act.

- **Pedestrian areas-** care should be taken when operating in pedestrian areas. A safe route for pedestrians should be provided with suitable signage and lighting. Enough room for material storage and vehicle movements is required. Noise, dust and fume levels should be reduced where possible. Required permits, method statements and risk assessments should be in place.

LOLER - Lifting Operations and Lifting Equipment Regs

This is an amendment to a European regulation. It deals with all aspects of Lifting and has specific requirements including.

- Trained people and competent people doing the job
- Plant and equipment tested and certified
- Work planed and supervised
- **SWL** clearly marked on all equipment • **Thorough examination**- all plant used for lifting must be examined and certified by a competent person.

  If the plant is used for lifting personnel, then it must be tested every 6 months if it is not used for lifting personnel it is every 12 months. The purpose of the Thorough Examination is to check for structural damage as well as

  defective operation
- **Lifting accessories**- Must be suitable for the job, be tested and certified, be in good condition.
- **Check Valves-** are fitted to the boom cylinder rams to prevent the boom dropping in the event of a sudden loss of hydraulic pressure caused by a burst hose or machine failure
- **Gross Weight-** is the weight of the load, packaging, lifting accessories and the quick hitch if that is not already accounted for on the lift chart

- **Lift Plan**- is a detailed description of how ton carry out a lift. An Appointed person produces the Lift plan, a lift supervisor implements the plan and supervises the job
- **Duties Chart-All machines used for lifting have their lifting capacities shown on duties charts located in the cab and in the manual. These charts show the maximum Height that a load be lifted depending on the reach of the machine, the angle of the boom and the weight of the load**

Rated Capacity**- maximum weight the machine can lift. This is set by the manufacture and is Found in the handbook or on the duties chart**

- **Lifting free on wheels – is lifting without the stabilizers down. The rated capacity for this type of lifting will be less than for lifting with the stabilizers down. The duties chart should be consulted before attempting this kind of lift.**
- **Pick and Carry-** this is when the load is lifted and then the machine is travelled whilst carrying the load. This kind of lifting reduces the capacity of the machine and the addition of the load will change the stability and centre of gravity of the machine as you travel

- **Contract Lift**- with a contract lift the crane company provide the lift plan, the equipment, the personnel
  and the insurance. They are in control of every aspect of the lift and assume responsibility for the lift

- **LOLER Register**- operators should complete the LOLER register weekly. Pre-use inspections should be carried out as per the Manufactures instructions. Recorded in the daily/weekly inspection sheet and any defects recorded

To fully understand LOLER specific training and guidance is required

PUWER – Provision And Use Of Work Equipment Regs

This is an amendment to a European regulation. It deals with the use of plant and equipment and has specific requirements including

- **Restraint systems-** seat belts must be worn at all times to prevent injury in the event of the vehicle overturning
- **ROPS (Roll over Protection Structure) -**prevent injury in the event of the vehicle overturning
- **FOPS- (Falling Object Protection Structure)** prevents injury from falling debris**.** If fitted to a vehicle then you do not need to wear the hard hat inside
- **Training and Instruction-** you must receive adequate instruction and training on any equipment before you can operate it
- **Fit for Purpose-** work equipment must be fit for purpose and safe to use
- **Information- Operators Manuals** and other information relating to the safe use of equipment must be with the equipment. This is to allow operators to check and gain necessary information

To fully understand PUWER specific training and guidance is required

Environmental issues -

- **Refuelling-** should only be done in a designated area. Clean containers and funnels should be used. Any spillage should be cleared up using suitable equipment. Waste should be disposed of in designated bins.

- **Condensation-** the machine should be refuelled at the end of the shift to prevent condensation building up in the tank as the machine cools down
- **Reducing environmental damage-** Operate safely, operate efficiently, , Tip materials in designated places, don't mix materials, Switch off when not in use, Don't overfill when refuelling, check tyre pressures, report leaks or damage, clear up spillage, dispose of waste in designated bins. Follow method statements and

  COSHH assessments
- **Designated routes-** should be adhered too. This will avoid damaging unspoilt ground, or completed work, or unnecessary contact will other plant or people

Types of 360º Excavators uses and limitations -

Tracked excavator **Wheeled** **Mini 360º** **Face Shovel Excavator** **Excavator**

- **Tracked Excavator-** The Hydraulic 360º Excavator took over from the rope operated machines The backhoe is operated by two multi-function leavers, they range in size from ¾ tonne up to 800 plus tonne.

  Suitable for use on a variety of terrains
- **Wheeled Excavators-** used widely in roadwork's and on finished surfaces, come with or without stabilizers
- **Mini Excavators-** suitable for use in confined areas. Many models now available as "Zero Tail Swings" (when slewing the machine, the ballast weights do no go beyond the edge of the tracks reducing the risk of hitting anything)
- **Face Shovels-** designed for bulk excavation in the quarry industry

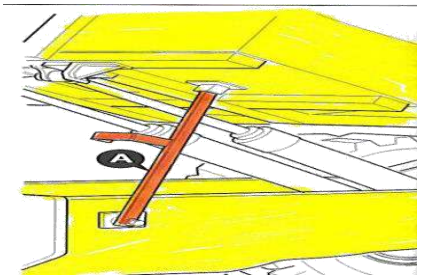
Pre-Use Inspections -

- Plant should be checked according to the manufacture's specifications.
- The checks should be recorded in the defect book or daily check sheet.
- Any defects should be reported
- Suitable PPE (gloves) should be worn when carrying out the prestart checks to
- prevent skin disease and contaminating the controls

- Engine oil, Hydraulic oil , Transmission oil, Coolant, Brake fluid,
- Tyres and the condition of the dumper should be checked

(Checks will vary depending on make and model always read the operators manual)

- If topping up with oil always do so in the designated area, use clean funnels and jugs or containers and clean around filler cap to prevent dirt entering the system
- Most 360º Excavators are fitted with a radiator to keep the engine cool. This is a pressurised system which pumps water around the engine keeping temperature down. Do not open a hot radiator or filler cap as the hot liquid inside will be released under pressure and could scald or burn
- If operator maintenance or servicing requires the operator to work beneath the raised skip, then the skip safety strut must be used to prevent the skip falling down and crushing the operator



- **Mirrors-** it is essential to maintain good all-round observation when operating the Telescopic Handler. To assist the machine is fitted with a variety of mirrors, they must be adjusted properly, secure, clean and free from damage**.**

Quick Coupler Systems-(Quick Hitch) – are designed to allow the fast and efficient changing of attachments. Although they improve performance and efficiency, they have been involved in many serious and fatal accidents in recent years. The systems themselves are safe to use but if not used properly or not maintained properly they will fail, and this unfortunately tend to have sever consequences. Couplers can be fitted to Excavators,

Shovels, Forklifts, Skid steers and other plant. The Quick couplers fall into 3 main categories -

- **Manual-** no hydraulic system fitted, and it is activated by hand.
- Locking devices to prevent accidental release is almost always a safety pin and clip.
- Safety Pin must be fitted, and it is the operators responsibility to ensure it is

- **Semi-Automatic** – the functions of the coupler are activated from the cab i.e. hydraulic ram opens and releases the attachment and is then closed to secure a new attachment. Locking device is manually activated at the coupler and is mostly a safety pin and clip, but can vary according to manufactures. The Operator is responsible for ensuring the attachment is secure on the machine and the locking device activated. This type of Hitch is no longer supplied and fitted to new machines in this country, but is still widely used on older machines

- **Automatic** – All functions are carried out from the cab including the secondary locking systems.

- It is the operator's responsibility to ensure it is used correctly as per the manufactures instructions

• **Pre use inspection of the Hitch-**

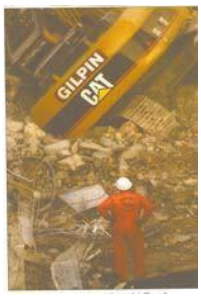
1. Check for any sign of damage to the coupler
2. Any cracks or wear which might reduce the strength
3. Check for signs of oil leaks
4. Remove any build-up of material which might be hiding defects or damage
5. Ensure locking device is activated or in the correct position
6. Correct size and weight of attachments are used
7. Check for excessive play which will allow too much movement of the attachment and may make it difficult to use efficiently or safely
8. The Coupler is tested and certified

Plant Stability Travelling or operating the machine affects the stability. Overloading the machine, travelling across slopes, carrying uneven loads, turning at speed, poor tyre pressure, too close to excavations can all lead to instability and possible overturning.

- **Centre of gravity-** is the point of balance of a load or of the machine. The higher a load is lifted the higher the centre of gravity of the machine goes. This can affect the stability of the machine. As the load moves forward (i.e. as a Tele-handler booms out or a dumper tips the load) the centre of gravity moves forward this could cause the machine to tip up if the machine is over loaded or not operated on suitable ground.

- **Tyres-** tyre condition can affect stability. The lugs or tread on a tyre provide grip assist steering and help with breaking. Worn or bald tyres can cause skidding or sliding, make it difficult to steer and are more susceptible to puncture. A damaged tyre could burst which would result in a loss of control and a possible accident

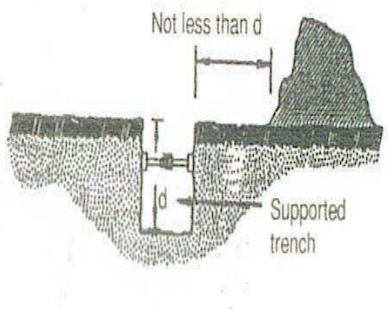
- **Brown Field Sites-**



• Ground could contain basements, cellars or voids.
The ground could be contaminated.
There could be old services or workings

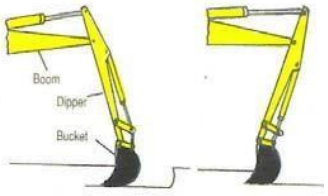
Procedure Excavating -

- To ensure the sides of the trench remain vertical when digging the machine must be level
- The minimum distance from the side of an excavation that material should be put is 1 meter

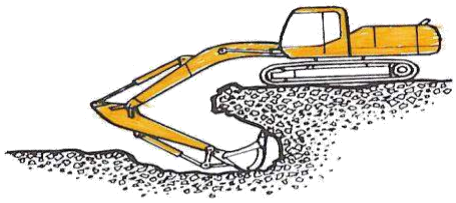


- As a rule, the material is placed the same distance from the side of the trench as the depth
- Ensure the relevant Permits are in place
- Suitable signing, lighting and guarding to exclude unauthorised people
- Know the depth and position of the trench
- Have suitable provision for the storage or removal of the spoil
- Have a banksman

- Shoring- depending on the ground type, the depth of the trench, the weather or the need for people to work in the trench it may be necessary to shore the trench
- At the end of the shift secure the area with a fence and sign to prevent anyone falling in, park the machine away from the excavation
- Attachments- always fit the correct size bucket for the trench specifications. Using a larger bucket will result in more material excavated, more backfill required and increase the cost of the job
- To excavate with the machine, it is necessary to use 3 functions at once, the boom must be raised, The dipper must be retracted towards the machine, The bucket must be opened



- Never Excavate from below the wheels or tracks of an excavator



- The ground may become unstable, and the machine could topple into the excavation
- Check the ground for services
  CAT (Cable Avoidance Tool) do not locate plastic

Lifting with the excavator

- **Lifting accessories must be tested and certified, be suitable for the job, have the SWL and id number clearly stamped and be in good condition**
- **The machine must be tested and certified for lifting**
- **The machine must be set correctly for lifting**
- **The load must be slung by a competent person**
- **A lift Plan and method statement must be in place**

What you need to know about the load -

- The weight of the Load to prevent overloading

Factors which affect the weight of the load- Shape and size, Type of material and density, Wet or Dry (water can add up to 25% to the weight of a load, Hollow or Solid, Full or Empty, Moving parts or liquid Load which could a change of weight distribution during a lift

Gross weight- is the weight of the load plus packaging, the pallet, any lifting accessories used in the list

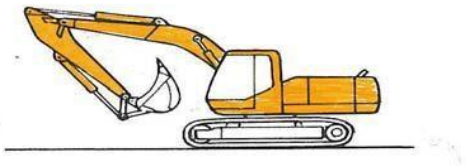
- Is the material contaminated- ensuring you wear correct PPE
- Type of material- ensuring you handle it correctly
- Is it liquid- might slosh around when moving and affect stability?

- Is it sharp edged- spillage might cause tyre damage?
- Loose or dusty might require eye protection or respiratory protection
- Centre of gravity of the load, the point of balance of the load

The Load Centre- is the distance between the Heel of the forks and the centre of the load

Travelling the machine -

- Check all around the machine is clear
- Ensure the seat belt is worn **(Seat belt** will secure operator to the seat and reduce potential injury in the event of overturning
- Set the machine for travel with the Bucket at the correct height (approx. 500mm of the ground



- Sound horn to warn others in area
- Look all around to ensure its clear then release brake (on wheeled) and move off
- Travel at a speed suitable for the load and the conditions
- Take care when travelling on slopes
- Ensure route is clear and free from personnel, plant, overhead cables and obstructions, uneven ground and excavations or trenches

Operating on a slope

- **Avoid driving across a slope as there is an increased risk of overturning**
- **Avoid landing loads downhill- the centre of gravity moves forward as the load is extended and this could cause the Machine to tip**
- **Avoid operating Cross track-**

Loading and unloading Vehicles

Before loading/unloading check-

- Vehicle is on level solid ground
- Vehicle is secure, handbrake on or wheels chocked
- Vehicle is capable of taking the weight

- Lorry bed is in good condition and wide enough to take the load
- The working area is Large enough to manoeuvre in and free from overhead obstructions
- No pedestrians or other traffic

- Do not drop materials from excessive heights as this can damage the body of the vehicle
- Excavators are short cycle machines. To ensure good efficiency the dumper should be placed in a position which requires the least movement from the excavator

Parking The Excavator -

- Park on level ground
- Do not block entrances or exits
- Do not park on soft or wet ground
- Do not block pedestrian routes
- Do not leave on stockpiles or close to trenches
- Handbrake on and out of gear
- Lower Buckets or attachments to ground
- Allow engine to idle for 1-2 minutes before switching off to allow turbo to slow down.

Failure to do this could damage the turbo

- Release hydraulic pressure
- Remove key and isolate to prevent unauthorised use

Travelling the machine on the Public Highway

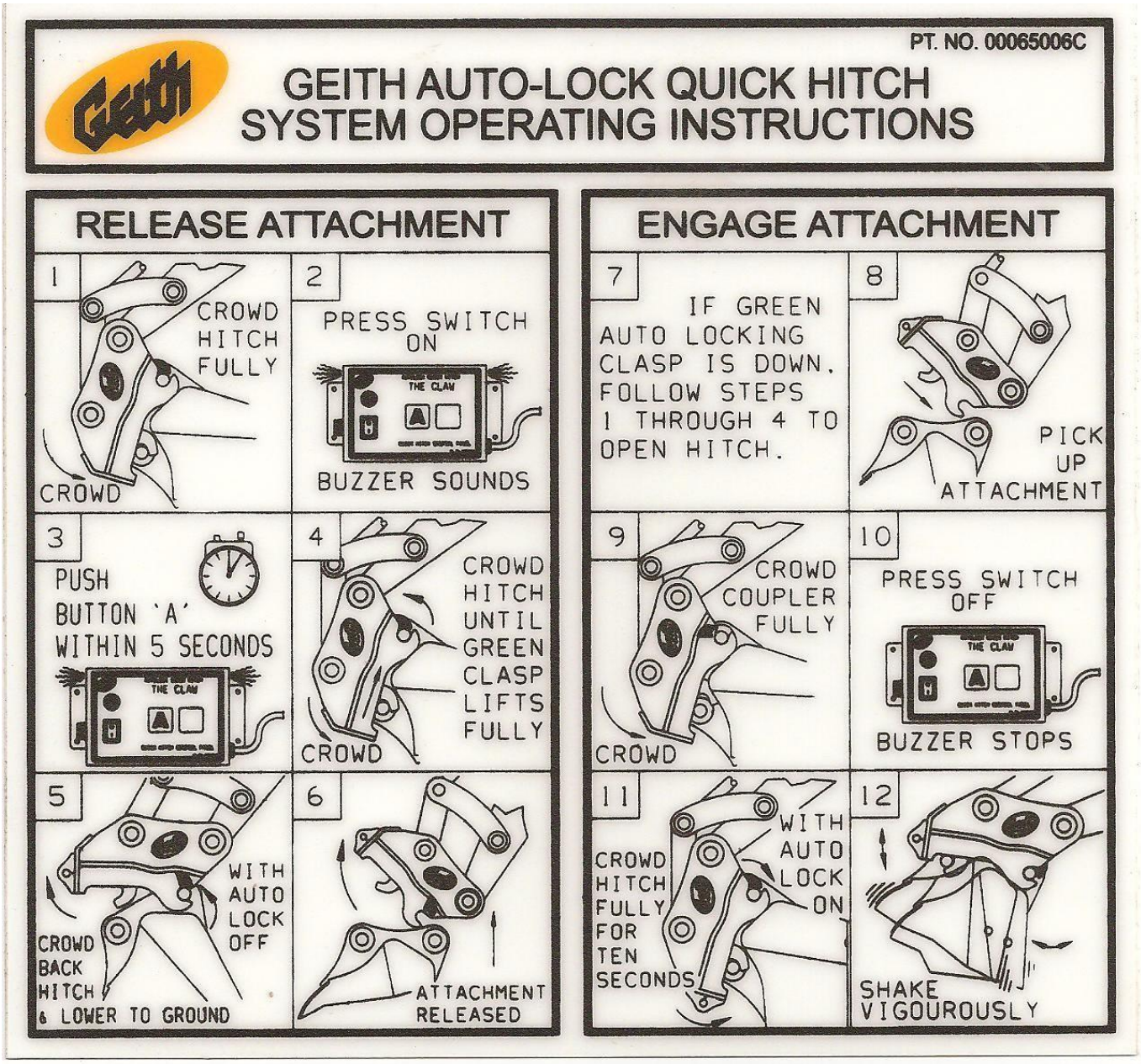
- Machine must be clean
- Taxed and insured
- Tyres, brakes and lights (lights set in travel position) meeting road legal standards
- Number plate
- No load on attachment
- Mirrors set and clean
- Operator must hold the correct Full Uk Driving licence category B for wheeled and H for Tracked machines, and 21 years old

Transporting the machine -

- The transporter driver is responsible for the loading operations
- A level area with sufficient room to manoeuvre should be selected
- No overhead obstructions
- The machine should be clean
- The transporter should be suitable and in good condition
- The ramps should be adjusted to suit the machine

- The operator’s manual should be consulted to find the loading procedures
- A Banksman should be used
- The area should be free of people and other plant

Quick Coupler



IMPORTANT INFORMATION

Please take time to read the above information. You will be required to change the bucket as part of your practical test.

If you have never used this type of quick coupler before, please inform us before the test starts and we will instruct you on its correct operation. Operating the hitch incorrectly could result in you not passing the practical test. Tell us you do not know how to use it, and demonstrate a sensible approach to plant safety, and you will receive the required instruction to allow you to successfully complete that part of the test. The choice is yours!!!

Safe use of excavators used as cranes study notes

Excavators were designed primarily for excavating and not lifting. Due to the complex nature of the construction industry, they are being used more and more for carrying out small repetitive lifting duties on site. These study notes are designed to keep you informed of the basic requirements needed for you to carry out a lift with an excavator safely.

When an object is needed to be lifted on a site, the first consideration should be **whether the excavator is the most appropriate type of machine to be used**.

Before using a quick hitch for carrying out lifting duties you should make checks to the quick hitch such as**, has it got a safe working load stamped on the lifting hook, is the quick hitch secure, are there any cracks or damage on the quick hitch and the condition of the lifting point.**

If you want to lift more than one ton with an excavator then the excavator then becomes a crane, if you want to use it for lifting more than a ton then three essential requirements need to be in place.

1. The boom cylinders need to be fitted with check valves, these valves are fitted to the base of the rams and prevent the boom from dropping to the ground of there is a loss of hydraulic pressure or if a hose was to burst.
2. A duties chart telling you what load you can lift and at what distance in front of the tracks and over the sides of the tracks must be on a sticker in the cab of the machine.
3. An alarm system, commonly none as the RCI or LMI Rated Capacity Indicator or load movement indicator, this device **helps provide the operator, within a specified tolerance, with warnings that the load is both approaching rated capacity and has exceeded rated capacity.**

If the above requirements are in place, then the excavator can be used as a crane. Please note that the manufacture determines the lifting/object handling capacity of the machine.

The slew radius for lifting is measured from the centre of the slew ring to the vertical line through the accessory attachment point.

Before moving with a load or carrying a load you should check **the excavator is capable and within limits, travelling with a load is authorised at that site, the travel route is clear of overhead hazards, the travel route ground is suitable, the excavator is configured correctly, environmental conditions, i.e. wind, are suitable, sufficient help is available, all actions meet lift plan criteria etc.**

When carrying out a lift you need to know what makes up the gross weight you are lifting, this does not include the weight of the boom or the dipper arm, but what is on the end of the dipper such as
Weight of the load itself, weight of the lifting accessories and weight of the bucket and/or quick-hitch coupler (if not already accounted for in the lifting capacity chart).

If given the task of carrying out a lift on site you need to make certain checks to the lifting accessories to make sure they are suitable, each strap chain, or shackle should be inspected every six months and tagged with a colour code for that particular six month period other things you should check for are **the accessories are serviceable, certificated, are correct for the load and able to support the load.**

Slings and chains should be checked before use for damage. if there are damaged, they should not be used and damage should reported to the supervisor immediately. All slings and chains will be marked with their Safe Working Load. Each sling and chain differ for its Safe working Load, this can be because of the angle of the chain or the way it is slung, for example, Choke lift, straight lift, or basket lift. If in doubt check on the tag of the sling or chain

Before you attach any sling or lifting equipment to the excavator you must make sure you have isolated the excavator hydraulic controls if this is not done, **unplanned movement can cause injury such as the bucket or quick hitch hitting the slingers/signaller in the face.**

Lifting hooks should be checked to see that It **is fitted with a working clip/latch to prevent the accessory from slipping out.**

When you carry out a lift the machine must be on level ground if possible as the load charts on the cab window ere only relevant if the machine is on firm level ground if not, the **(load to machine) radius increases when working downhill, *possibly* causing the machine to tip.**

Before carrying out a large lift you should carry out a lifting Plan – under the LOLER (Lifting operations & Lifting Equipment Regulations) lifts should be planned and supervised
The purpose of a lifting plan is **to show the details how the lifting operation must be carried out, and what equipment and resources are required.**

If you are attaching accessories to a quick-hitch coupler, two reasons why the coupler should be tilted in the downwards position (ram extended).**are the accessory attachment point is near to the dipper/bucket pin-hole area**

where the radius is calculated from and that fouling of the accessory on the coupler could occur restricted movement and cause bending and twisting.

Before lifting with a load, you should always carry out a test lift, you should lift the load just clear of the ground approximately 2 inches from the floor to see if the sling can take the weight of the object, you are lifting that the load is secure and it does not slip sideways or along the load and cause instability. If there is a problem, re -adjust the lifting equipment and start another test lift. **Only you and the slingers are allowed in the lifting area.** If the load you are lifting inadvertently or accidentally lands, **The integrity (security) of the lifting accessory to both the machine and the load must be checked before continuing.**

When slewing with a load it is always better to slew to the left than the right as your view can be obscured by the boom, **when slewing with a load you should always look ahead of the load. If swinging with a load it can cause an increase in radius and create instability causing the machine to tip over.**

The most dangerous or hazard area when lifting with an excavator is within **the working radius of the boom/dipper.** You should always gain eye contact with the driver before entering the working radius of an excavator, and when carrying out a lift only the slingers/signaller should be in this area.

When carrying out lifts the safe lifting capacity is reduced when slewing the load over the sides of the tracks or wheels. **This is because the counterweight effect/stability is reduced due to a shorter 'wheel/track base.**

Remember The safe working load (SWL) or working load limit (WLL) of a multi-leg chain sling only applies, when each leg is equally loaded and each leg is within 90 degrees of the other. Accessories must only be attached to manufacturers' approved lifting points if this procedure is not followed many hazards can occur such **as**
Failure or damage can occur to the machine, accessory or load, the accessory can detach from the machine, and regulations have not been complied with.

If lifting, were possible the bucket should be removed, the bucket adds additional weight to the gross weight to be lifted and can cause the slings and chains to become obscured from view and entangled in the bucket teeth.

If the machine's rated capacity/object handling capacity chart is not available for reference, then no loads are to be lifted and no other methods used to help calculate the rated capacity for the machine. Only the manufactures recommendations can be used.
Long loads should be fitted with a swivelling shackle to help prevent the load from coming into contact with excavator.