

# Quarries Skills Certification Scheme

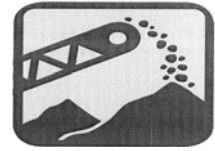
## Safe Operation of Earthmoving Plant



### Mini Digger

SOLAS

An tSeirbhís Oideachais Leanúnaigh agus Scileanna  
Further Education and Training Authority



Published by  
SOLAS the Education and Training Authority  
27/33 Upper Baggot Street  
Dublin 4

First published 2009

© SOLAS

ISBN

SOLAS has made every effort to ensure that the information contained within this publication is accurate. Its content should be used as guidance material and not as a replacement for current regulations.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission in writing from SOLAS.

Printed in 2013

6.

# Receipt

I have received a copy of the QSCS Safe Operation of Earthmoving Plant – Mini Excavator notes and agree to read it carefully and comply with all the guidance and advice on safety and good working practices which it contains.

Signature	
Full Name	
Date	

Name of Company or Organisation	
Address	

# Contents

Introduction	5
1. Safety, the law and you	6
2. Accident prevention and control	9
3. Safe use of Mini Excavators	11
4. Operator servicing and maintenance duties	17
5. Mini Excavator safety checklist	18
<b>Appendices</b>	
A Recommended signals	19
B Statutory Certification required	21

## Introduction

This guide for the safe operation of Mini Excavators has been produced for plant operators. It sets out to provide guidance in an easy to read form, paying particular attention to the duties of the Mini Excavator operator. It covers a wide range of operating conditions and activities, and aims to promote safe working practices which comply with current legislation and the precautions to be taken if accidents are to be avoided.

Specific sections on the preparation and operation of Mini Excavators contain readily accessible information in a checklist format with a simple **Do's** and **Don'ts** message.

This guide complements manufacturers' instructions and recommendations with regard to:

- general safety legislation and safe operating procedures for Mini Excavators
- safe and efficient use of Mini Excavators
- basic operator maintenance.

Manufacturer's operating manuals must always be used for the relevant machine and referred to as and when required. The manufacturer of the machine has no direct control over the operation of the machine – *it is the responsibility of the operator to work safely at all times.*

This guide does not attempt to try to cover every aspect of working conditions when using Mini Excavators and does not cover every make and model of Mini Excavator available.

## 1. Safety, the law and you

This section provides guidance for employers, employees and the self-employed who use mobile plant equipment. Minimum legal requirements are outlined which relate to the safe use of mobile plant. Various Acts of the Oireachtas and statutory requirements, examples of which are listed below, provide the definitive legislation to be followed.

### Legislation

Legislation to be followed includes the **Safety, Health and Welfare at Work Act 2005** (SHAWWA). Parts of the Act and other regulations connected with the operation of plant include:

- *General Duties of Employer*
- *General Duties of Employee and Persons in Control of Places of Work*
- Protective and Preventive Measures
- Safety Representatives and Safety Consultation
- The Health and Safety Authority
- Offences and Penalties

*All Health and Safety rules also apply to Employers, Self-Employed persons and Employees*

### Regulations and Codes of Practice

Regulations made under an Act of the Oireachtas are mandatory

**The Safety, Health and Welfare at Work (Quarries) Regulations 2008 S.I. No. 28** include:

- Safety and Health Management
- General Safety Provisions
- Safety Provisions for ancillary Activities and Installations
- Explosives
- Safety of Excavations – including Quarry Faces, Tips and Lagoons
- Air Receivers
- General Health Hazards
- Welfare
- Quarries Skills Certification Scheme
- Vehicles requiring Auxiliary Devices and Visual Aids
- Geotechnical Assessments

- **The Safety, Health and Welfare at Work (General Application) Regulations 2007 S.I. No. 299** include:
  - Workplace and Work Equipment
  - Use of Work Equipment
  - Personal Protective Equipment
  - Manual Handling of Loads
  - Display Screen Equipment
  - Electricity
  - Work at Height
  - Control of Noise at Work
  - Control of Vibration at Work
  - Safety Signs at Places of Work
  - First-aid
  - Explosive Atmosphere at Places of Work

The introduction of the above legislation, which protects people at work and those who may be affected by their actions, has helped to improve our working environment.

The legislation concerns employers, employees and the self-employed, and makes people responsible for their actions, as well as their omissions, including others affected by their actions.

Regulations made under an Act of the Oireachtas are mandatory and may be supplemented by an Approved Code of Practice (ACoP), which advises organisations and their staff on how to comply with the law.

If the advice of the ACoP is followed then generally you are meeting the requirements and complying with the law. If you, or your organisation, are prosecuted for breaking a health and safety law and it is proven you did not follow the advice in the ACoP, you must prove you have complied with the law in another way.

*Penalties can be imposed on persons who are found guilty of a Health and Safety Offence (on summary conviction or on indictment), which may include:*

- a fine
- a term of imprisonment.

***Penalties may be imposed for:***

- Contravening any of the relevant statutory provisions.
- Disobeying a Prohibition notice.
- Unauthorised disclosure of information.
- A breach of the conditions of a licence

## Duties of personnel

It is in the interest of every employer and employee involved in the use of mobile plant and equipment to promote safety within their workplace.

### Legal duties of employers

*'Every employer shall ensure, so far as is reasonably practicable, the safety, health and welfare at work of his or her employees.'* \*

#### Employers have a duty to:

- provide a safe working environment that is without risk to health
- provide and maintain safe plant and equipment and ensure it has been designed, constructed, tested and examined to be safe
- carry out risk assessments and provide their employees with clear and appropriate information on any risks that exist in the workplace and how they intend to reduce those risks
- prepare a safety statement based on the risk assessment
- provide suitable protective clothing and equipment (PPE) to ensure the health and safety at work of their employees. 'Every employer shall ensure that any measure taken by him or her relating to safety, health and welfare at work do not involve financial cost to his or her employees' \*
- provide employees with any necessary information, including legal requirements, adequate instruction, training and supervision *'in a form, and manner and, as appropriate, language that is reasonably likely to be understood by the employee concerned'* \*
- obtain the services of a competent person for Health and Safety purposes
- provide adequate welfare facilities

### Legal duties of employees

In general terms, the law says that you must:

- be responsible and as safe and careful as possible in your work, so as not to put the health and safety of yourself or others at risk, including members of the public
  - co-operate with and assist your employer or any other person, as far as necessary, to enable them to carry out their legal duties in health and safety
  - not interfere with or misuse any safety devices or equipment
  - not intentionally or recklessly interfere with anything provided in the interest of health, safety and welfare
  - follow your employer's procedures and the manufacturer's instructions which apply to the care and safe operation of the machine you are responsible for
  - inform your employer, without unreasonable delay, of any work situation that you are aware of which presents a risk to the health and safety of yourself and others
  - report (without delay) any defects in plant and equipment which might endanger safety.

*All Health and Safety rules also apply to self-employed persons*

\***Source:** *Safety, Health and Welfare at Work Act 2005*



## 2. Accident prevention and control

Accidents are unplanned, unwanted events which can injure or kill people. Industry also pays a price with loss of working hours, loss of production and damage to plant and equipment and extra costs.

Remember that **you**, as an operator of plant equipment, **are the key to safety**: good safety practices not only protect you but also protect others around you.

Accidents can be caused by unsafe working practices and attitudes of people in the workplace. By following a safety programme and adopting safe working practices, unsafe conditions can be avoided. This contributes to improving safety in the workplace.

Prevention can remove or reduce the likelihood of an accident by following some basic rules, for example:

### Do

- Protect yourself – wear all protective clothing and personal safety equipment issued to you or required by your working conditions
- Follow a safety programme – understand and follow safety procedures when working on site and using plant and work equipment
- Assess your ability to do the job – ensure you are fully aware of the job requirements and how they need to be carried out
- Stay alert – know where to get help. Know the first aid and emergency procedures
- Make yourself aware – study the manufacturer's operator's manual for using your plant and equipment. If the manual is not provided, ask your supervisor or the suppliers of the plant/equipment to supply one
- Report faulty/unsafe plant or equipment and any dangerous occurrences and incidents
- Report unsafe conditions in the quarry
- Travel the plant equipment safely so as not to affect its stability
- Be careful – human error is caused by carelessness, fatigue, preoccupation and lack of concentration. Ensure you watch out for others who are affected by your actions
- Ensure all personal injuries, no matter how slight, are reported and entered in the accident book (or equivalent)
- Take advantage of any training programme offered by your employer or contractor. You are never too old to learn new practices or techniques.

## **Don't**

- Use plant or work equipment that you have not been trained to use
- Overload any plant or work equipment either by lifting or loading
- Operate plant and work equipment unsafely or at unsafe speeds
- Allow anyone to be carried or lifted in the bucket
- Attempt to carry out work on moving parts of plant or work equipment with the safety guards removed
- Indulge in horseplay on plant or work equipment
- Attempt to operate any type of plant or work equipment if you are under the influence of drugs, alcohol or any other substance which affects your health or judgement
- Ignore warning instructions or safety signs.

### **3. Safe use of Mini Excavators**

If you are an operator of a Mini Excavator you are legally required to be responsible for your own safety and that of others who are working nearby.

Common sense plays a major part in the safe operation and working of a Mini Excavator. All operators should be aware of dangers and hazards, which could injure them or other site workers nearby, or cause damage to the machine.

Operators of Mini Excavators are responsible at all times for the safety of their machine and its load.

Simple measures taken by yourself, your employer and by following some basic rules can reduce the possibility of risk. For example:

#### **Do**

- Comply fully with instructions given by quarry management and supervisors
- Follow the manufacturer's instructions (operator manuals) for the specific Mini Excavator you are operating
- Take safety precautions when using your machine prior to, during and after work
- Operate within the machine's capabilities.

#### **Don't**

- Operate any machine unless you have received appropriate training and are authorised to do so
- Ignore hazards
- Misuse, tamper or interfere with your machine and any associated safety equipment provided to you
- Endanger your own health and safety, or that of anyone else, through being negligent.

#### **Before use**

- Always check that the Mini Excavator is serviceable and safe to use
- Carry out daily checks and maintenance
- Keep cab glass clean, if it is dirty it may distort your vision
- Set the visual aids, "mirrors or cameras" to give you a close view behind the machine when you are correctly seated
- Check working areas for hazards and obstacles, which could affect the operation of the Mini Excavator.

## During operation

### Do

- Look out for people working and hazards such as stockpiles, excavations and plant
- Face the machine and use the steps and handholds when getting on or off. Ensure you maintain three points of contact
- Wear the seat belt.
- Ensure when loading vehicles that they park in the most appropriate 'position' to enable the slew movement to be kept to a minimum
- Ensure when loading dumpers, containers, skips etc., that the load is evenly distributed and does not overload the machine
- Ensure you travel the machine with the Mini Excavator positioned at the same end as the blade, especially on hard and rocky ground
- Place excavated material clear of the excavation to prevent the weight of the material collapsing the sides and to prevent spillback
- Keep a safe distance from other plant or vehicles
- Ensure all cab doors are closed or are locked in the open position
- Extend the dipper bucket attachment uphill when travelling up a steep slope and ensure you keep the lower edge of the bucket attachment as low to the ground as possible and choose a slow speed for travelling uphill
- Let the bucket attachment slide over the ground while travelling downhill and select a slow speed
- Before leaving the machine unattended: drive clear of the working area; lower all raised equipment; stop and apply brakes; disengage drive and controls; stop engine and remove ignition key
- Keep your boots as clean as possible in wet/muddy conditions. Brakes become less effective in these conditions. Wet/muddy boots can cause your feet to slip off the foot controls at vital moments.

### Don't

- Allow anyone to hitch a ride in the cab
- Allow anyone to be lifted in the bucket
- Allow anybody to work under any raised attachments
- Work or drive too close to banks, trenches or under overhangs, or anywhere there is danger of collapse
- Indulge in games or horseplay
- Reverse the machine any great distance – slew around and face the direction of travel when travelling with the Mini Excavator
- Run the engine in an enclosed area for long periods
- Leave the machine unattended with the engine running.

## **After use**

- Park on firm, level ground in a selected area, with sufficient distance from overhanging quarry faces and edges
- Apply brakes; ensure drive and controls are disengaged and ensure all isolator controls are engaged
- Stop engine and shut down in accordance with the manufacturer's recommendations lock and secure your machine
- Visually check the machine for defects, remove any trash build-up from undercarriage
- Top up the fuel tank as requested by quarry management
- Travel to and from your work area on routes as requested by the quarry management

## **Additional precautions to be followed for Mini Excavators**

### **Do**

- Communicate regularly with your work colleagues and others, and keep them informed of what you will be doing
- Ensure that if signals are to be used to communicate they are approved and understood by everybody involved (see appendix A for illustration)
- Ensure the area where you will be working has been checked for the presence of any buried live services before commencing any excavations
- Ensure you work within the minimum clearance required for working beneath overhead power cables. Check with quarry management and the local electricity supplier
- Avoid travelling across a slope or working sideways on a slope. If the slope is too steep the machine could roll over
- Make yourself aware that due to the design characteristics of Mini Excavators it is possible to excavate underneath the machine and thereby affect its stability
- Take extra care when travelling up and down hillsides and on embankments. Ground conditions can change dramatically due to weather conditions
- Before changing direction always stop the machine and drop engine speed to idle before changing from forward to reverse – be aware of persons in the working area
- Swing the boom slowly to prevent any chance of the machine becoming unstable
- Set the visual aids, mirrors or cameras to give you a close view behind the machine when you are correctly seated
- Use the services of a signaller/banks person to assist you if visibility is restricted or there are obstructions in the vicinity
- Take into account that cold weather can affect! ground conditions, visibility, and control of the machine, take effective measures to counteract and reduce the hazard
- Ensure that when you are installing/changing an hydraulically operated attachment or hand held tools your machine is correctly set up to suit them

- Ensure when changing buckets all pins are greased and all locking devices are sound and secure. If using a quick hitch device ensure all retaining devices are secure, operate your machine's dipper and bucket rams several times to check that the bucket is secure before attempting to use it
- Take care when digging near obstructions, ensure you position your machine so there is adequate room to slew left or right as required
- *Road travel: before taking a Mini Excavator on public roads, ensure the machine is prepared for road travel, complies with all traffic regulations and obey all driving laws (you may need to refer to the manufacturer's operating handbook before selecting the road travelling positions for the backhoe on your specific machine)*

## Don't

- Undercut an excavation face below or above your work position
- Change direction on steep slopes or the Mini Excavator could tip over
- Swing the bucket of your machine over a vehicle cab
- Overload dumpers, containers, skips etc.
- Exceed the working capacity of the boom at maximum reach
- Attempt to use attachments that are unsuitable to use with your machine
- Rely on the spoken commands, sites can be noisy. Follow approved signals
- Attempt to tip/push materials into excavations where there is no edge protection (stop block or earth-berm)
- Operate too close to banks or excavations
- Use your Mini Excavator for lifting duties unless it has been certified and authorised to be used as a lifting appliance.

### **Note:**

*As an operator of a Mini Excavator you should be aware that there are regulations concerning the use of excavators used as cranes or lifting appliances. Your machine and the lifting accessories you use may require certification to carry out certain lifting duties. The regulations are quite clear on what items require certification. You or your company may be requested by your client to produce this certification before you commence work or during work activities in the quarry. You should always comply with this request. If you are unsure what to do in this situation consult your supervisor for further guidance (see Appendix C for statutory certification requirements).*

## 4. Operator servicing and maintenance duties

The Operator's contribution to maintenance of the machine is of prime importance.

It is essential that adequate time and facilities are provided to carry out maintenance of your machine. Supplies of materials and substances (oils, greases, coolants etc.) should always be to hand, with suitable provision for storing them.

All maintenance should be carried out in accordance with the manufacturer's recommendations and your company's procedures.

Whatever system of maintenance and servicing is used, all operators have the responsibility to ensure the machine is in a safe condition for work.

**Pre-use checks:** It is estimated that the recommended pre-use checks of many manufacturers would include the checking and adjustments of the following:

- fluids – engine oil, coolant, transmission, brake, hydraulic
- tracks and track running gear
- hydraulic pipe/hose condition, security leakages
- hydraulic rams condition, security, leakages
- lights, warning and safety appliances, such as reversing devices, horn protective guards
- ROPS/FOPS, seat and seat belts, driving position, mirrors
- controls, gauges, warning lights and other types of safety devices.

### Running checks

- Hot/Cold starting methods
- Function of steering/brakes/hydraulic/electrical and mechanical systems
- During cold weather and extremely hot conditions always be aware of the operating temperature of the machine.

### Maintenance and servicing schedules

Apart from daily pre-start checks, servicing schedules are usually based on machine running hours, therefore regular checks need to be kept on the machine's hour-meter reading.

Operators are likely to carry out only basic servicing on their machine in accordance with the manufacturer's recommendations and company procedures. In addition to pre-start and running checks, operators would usually be responsible for:

- cleaning air filter dust bowls
- draining water and sediment/fuel/water separators
- replenishing coolants, lubricants and fluids
- greasing all greasing pins and pivot points
- checking battery levels and condition of their terminals and cables
- carrying out minor adjustment.

You should only carry out the servicing on your machine if you have been trained and have been authorised to do so.



**Do not** attempt to carry out any major maintenance, repairs or adjustments to your machine which you are not authorised to carry out. This must be done by a suitably qualified and competent person!

## **Do**

- Ensure the machine is on firm and level ground before attempting to carry out any operator maintenance
- Where practically possible, place signs on the machine to prevent accidental start up before carrying out your operator maintenance duties
- Carry out regular visual checks for any defects, damage, leaks
- Keep footplates and steps clean and free from mud, dirt, oil, ice and snow etc.
- Complete daily/weekly maintenance/defect sheets if your company issues them to you. All faults/defects should be reported immediately and corrected before the machine is used.

## **Don't**

- Attempt to carry out any operator maintenance on a machine with a hot engine
- Attempt to inspect or clean the machine with the engine running
- Attempt to refuel or top up lubricants and fluids while the engine is running
- Remove the hydraulic tank filler cap or cover plate while the engine is running, stop the engine and release the pressure
- Remove the radiator cap when the engine is hot
- Add coolant to a hot engine
- Overfill the engine oil or fuel tank.

## **Auxiliary Devices and Visual Aids Required**

Movement Alarm and flashing Beacon with CCTV or Convex Mirrors or a combination of both to allow vision from the drivers seat (without slewing) all points more than 1 Metre high and 1 Metre from the machine

## 5. Mini Excavator safety checklist

**S**afety starts with you. Remember! You, as a Mini Excavator operator are the key to safety. You are legally responsible for your own safety and that of others working nearby.

**A**ccidents are unplanned, unwanted events, which can injure or kill people. Simple measures taken by your employer and yourself can reduce the risk of them happening.

**F**ines can be imposed on your employer and yourself for breaching Health and Safety Regulations (in some instances it can also lead to imprisonment).

**E**nsure you wear all protective clothing and equipment and personal safety equipment (PPE) issued to you or required by your working conditions.

**O**nly operate a Mini Excavator that you have been trained to use and are familiar with.

**P**assengers should not be carried on your machine (even for the shortest of journeys).

**E**nlist the services of a signaller/banks person to assist you if your vision is restricted or there are obstructions in the vicinity. Ensure there is edge protection when tipping materials into excavations.

**R**eport all accidents (no matter how slight), faulty/damaged plant and equipment and any dangerous incidents. Stay alert, know where to get help, know the emergency procedures on site.

**A**lways drive your Mini Excavator with due consideration for others and adjust your speed to suit weather and site conditions.

**T**ravel your Mini Excavator safely, so as not to affect its stability. Take extra care when travelling on slopes or on hillsides.

**I**nspect your machine and working area at regular intervals before use to spot any defects, hazards or distractions. Take nothing for granted!

**O**bserve all warning/safety signs and traffic regulations.

**N**ever carry out a manoeuvre with your Mini Excavator if it is likely to endanger yourself and others (even if your work colleagues request it to try and cut corners on a job). If in any doubt seek guidance from your supervisor.

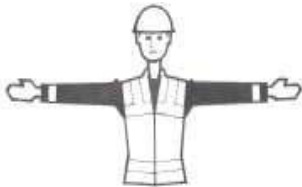



**S**hut down, secure and isolate your Mini Excavator in accordance with the manufacturer's recommendations and your company's procedures.

## APPENDIX A


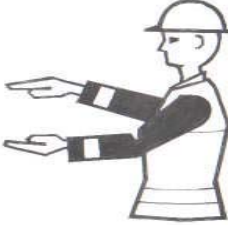


### Recommended signals

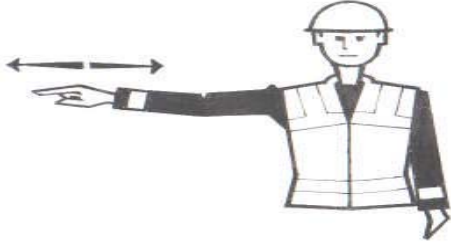
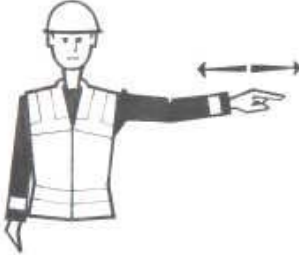


#### Note:

The signaller should stand in a secure position where he/she can see the load and can be seen clearly by the driver and should face the driver if possible. Each signal should be distinct and clear.

<p>START Attention</p> <p><b>Start of command</b></p>	<p>Both arms are extended horizontally with the palms</p> <p><b>Facing forward</b></p>	
<p>STOP Interruption</p> <p><b>End of movement</b></p>	<p>The right arm points upwards with the palm facing</p> <p><b>Forwards</b></p>	
<p>END Of the operation</p>	<p>Both hands are clasped at</p> <p><b>Chest height</b></p>	
<p><b>RAISE</b></p>	<p>The right arm points upwards with the palm facing forward</p> <p><b>and slowly makes a circle</b></p>	

## Recommended signals (continued)

<p>LOWER</p>	<p>The right arm points downwards with the palm facing inwards and slowly makes a circle</p>	
<p>VERTICLE DISTANCE</p>	<p>The hands indicate the relevant distance</p>	
<p>MOVE FORWARDS</p>	<p>Both arms are bent with the palms facing upwards, and the forearms make slow movements towards the body</p>	
<p>MOVE BACKWARDS</p>	<p>Both arms are bent with the palms facing downwards, and the forearms make slow movements away from the body</p>	

<p><b>RIGHT</b> To the signaller's right</p>	<p>The right arm is extended more or less horizontally with the palm facing downwards and slowly makes small movements to the right</p>	
<p><b>LEFT</b> To the signaller's left</p>	<p>The left arm is extended more or less horizontally with the palm facing downwards and slowly makes small movements to the left</p>	
<p><b>HORIZONTAL DISTANCE</b></p>	<p>The hands indicate the relevant distance</p>	
<p><b>DANGER</b> Emergency stop</p>	<p>Both arms point upwards with the palms facing forwards</p>	

QUICK All movements faster  
SLOW All movements slower

## APPENDIX B Statutory Certification required for Excavator

- The Safety Health and Welfare at Work (General Applications) Regulations 2007 came into operation on 1<sup>st</sup> November 2007 and are quite clear on what items of plant require certification.
- Forms for recording Tests/Inspections are no longer prescribed. Any form can be used provided it contains the information specified in Part E of Schedule 1 of the Regulations

### Excavator or Loader used as a Crane

Regulation No	What is it	Who completes it	When is it required
55. [2] (a) [ii]	Certificate of Safe Working Load.	Competent Person.	Before machine is first used as a Crane or after substantial alteration /repair.
55. [2] (j)	Report of results of thorough examination.	Competent person	Every 12 months or after substantial alteration/repair.
43. [1] f)	Report of results of weekly inspection	User/Operator	Weekly
43. [2]	Report of the results of test and thorough examination	Competent person	After any substantial alteration or repair affecting its strength or stability.

#### Notes:

- An Excavator or Loader which is hydraulically-operated must be fitted with check valves on the cylinders used for lifting. (Except for machines with a maximum rated lift capacity of 1000kg or less.)
- Unless a machine is fitted with a Safe Load Indicator the Safe Working Load shall be the same for all radii at which the Jib or boom is operated and shall not be greater than the load which the machine is in its least stable configuration is designed to lift with that jib or boom.

### Lifting Accessories (Chains, Ropes and lifting accessories)

Regulation No	What is required	Who completes it	When is it required
57. [1] (a) (v)	Certificate of Test & Examination.	Manufacturer / Supplier.	When supplied and while Lifting Gear is in use.
57. [1] (a) (v)	Report of Results of thorough examination	Competent Person.	Every six months.
57. [1] (i)	Report of annealing or appropriate heat treatment.	Competent Person.	When Heat Treated and at intervals as specified by the Competent Person.

#### Notes:

- Lifting accessories include: chains, chain slings, rope slings (except a fibre rope sling), or similar gear, rings, links, hooks, plate clamps, shackles, swivels and spreader beams etc.
- A Certificate of Test and Examination is not required for a fibre rope or a fibre rope sling. Regulation 57 states "in the case of a fibre rope or a fibre rope sling, information from the manufacturer on its safe working load is available" and "it is marked in plain legible figures and letters with a Safe Working Load and a means of identification.