Training Standard

Excavator 360° below 10 tonnes: wheeled (novice)

Learning outcomes Including additional guidance to support training delivery and final assessment *The learner will be able to:*
explain the factors that help maintain a safe working environment in the construction industry, and their responsibilities as a 360° excavator operator *Delivery to include*: • why the industry has many hazards and why safe working practices must be adopted and maintained • why personal health and safety is not just physical injury and can include the effects of noise and vibration. All of which can lead to lost time, lost income, expense for the employer, fines, custodial sentences • Health & Safety at Work Act 1974, Provision and Use of Work Equipment Regulations (PUWER), Management of Health and Safety of Work (MHSW) Regulations, Construction (Design & Management) Regulations (CDM), Vibration at Work Regulations, Road Traffic Act, HSG144, LOLER, HSG47 in accordance with risk assessments, method statements, codes of practice and other relevant legislation, regulations, and industry good practice • operators' moral, legal, and environmental obligations • reporting structures, the importance of good communication on site (colleagues, management, and other workers on site) • previous incidences involving relevant plant and pedestrians • working with other related roles for example, marshallers, supervisors, other plant operatives, other occupations • awareness of the limits to their personal knowledge, skills, and experience and when situations exceed these limits the need to stop and seek further advice from supervisors or mentors *Assessment criteria:* • identify common hazards on a construction site • explain safe working practices relevant to the role of the 360° excavator operator • explain personal health and safety relevant to the role of 360° excavator operator • identify aspects of legislation, regulations, and industry good practice relevant to the role of 360° excavator operator • describe reporting structures and the importance of good communication on site • explain the responsibilities of a 360° excavator operator
identify and extract information from the manufacturers' handbook/operator's manual, and other information sources including digital *Delivery to include:* • use of the operator's manual (for the specific machine) during the practical elements of training to identify key preparation, operational and safety aspects of the machine • types of information sources including machine control systems

Assessment criteria:

- identify and extract key elements for the preparation and safe use of the machine using various sources

locate and identify the major components, signs and decals and all controls of the excavator and explain their functions

Delivery to include:

- the purpose of principal components, the basic construction, controls, and terminology
- how correct and sympathetic use of the controls can ensure efficiency and safety of the machine and help prolong machine life by reducing wear and tear
- purposes of Roll Over Protection Systems (ROPS) and Falling Objects Protection Systems (FOPS) and other protection systems
- machine control systems – efficiencies, GPS

Assessment criteria:

- identify and explain the function of all controls and warning systems
- explain why the correct and sympathetic use of controls aids efficiency, longevity, and safety
- state the purposes of ROPS and FOPS and other protection systems
- locate and identify the major components, signs, decals, and controls of the machine
- outline the purpose, types and function of machine control systems and electronic aids

conduct all pre-operational checks in accordance with manufacturers and legislative requirements

Delivery to include:

- complete all pre-start and running checks before any activity takes place, including visual checks for damage, functionality, and effectiveness
- checking all componentry systems are fully functional, including mechanical, hydraulic, pneumatic, electrical, and electronic etc.
- replenish fuels, fluids, and lubricants, and undertake grease-based lubrication activities
- manufacturers periodic checks and operator level maintenance requirements
- defect reporting requirements
- carry out routine adjustments
- safety systems functions including emergency stop
- health and safety requirements when undertaking basic maintenance activities including Personal Protection Equipment (PPE)
- check condition and function of seatbelt and any other restraining equipment
- check condition and function of any lighting and warning systems
- requirements for dealing with fluid spills including prevention and clean-up methods

Assessment criteria:

- conduct all pre-operational checks as above in accordance with manufacturer guidance and legislative requirements (note: verbal description to the instructor of specific pre-start checks

will be acceptable if the machine is hot where they cannot be done safely for example, engine fluids) - *this should be observed during practical assessment* • explain the procedure for defect reporting and why it is important
identify and maintain Personal Protective Equipment (PPE) and appropriate safety control equipment for excavator use *Delivery to include*: • what safety control equipment/PPE should be worn/used for machine operations and include the following: suitable safety footwear, ear defenders, face/eye protection, dust mask, suitable gloves, overalls, hard hat, Respiratory Protective Equipment (RPE), protective clothing and other related safety equipment • appropriate use of Local Exhaust Ventilation (LEV), such as, in confined spaces • why weather conditions, including heat and cold, can determine what PPE is worn when using specific machine and the personal effects of incorrect equipment *Assessment criteria:* • describe what forms of PPE and RPE must be worn for site operations • explain why PPE and RPE must be worn for site operations • give an example of when use of LEV would be appropriate • state how severe weather can affect safety and health with insufficient equipment
safely get on and off the excavator *Delivery to include:* • working at height requirements • safe use of all hand holds and steps • facing the machine when getting in to and out of the excavator cab for operational and maintenance purposes • effects of continually getting in to and out of the excavator for example, fatigue, increased risk of falling and other related hazards • safe areas to get in to and out of the excavator for example, ground location, other vehicle movements and other related hazards • procedures for accessing the excavator when carrying out adjustment and maintenance activities *Assessment criteria:* • explain the effects of not using correct procedures to get in and out of the machine cab including when carrying out adjustment and maintenance activities • demonstrate the correct procedures as listed above – *this should be observed during practical activities* • explain the areas for safely getting in and out the excavator cab
prepare and configure the excavator for site travel

Delivery to include:

- use of seatbelts and other restraining equipment
- adjustment of seating position and mirrors
- chassis checks to include wheels and tyres, stabilisers, axles, steering, and braking systems
- isolation controls
- starting and stopping procedures including cold starting and those for turbochargers
- procedural requirements for exhaust particulate filter cleansing activities
- types of visibility aids and what factors can affect effective vision
- where and why effective vision is very important
- where issues can arise where vision is limited during operation
- ensuring warning and safety systems are operable
- legislative requirements and restrictions for being on the public highway
- machine configuration for site travel
- carrying of passengers/non-authorised personnel
- use of travel controls and speed modes
- transmission/speed modes, and braking controls to include parking brakes settings
- steering systems steerable mode settings

Assessment criteria:

- explain why the use of seatbelts and other restraining equipment should be worn at all times
- describe the types and function of isolation systems
- explain the importance of carrying out chassis checks, to include any tyre cleaning activities
- explain the impact of not following starting and stopping procedures of turbocharged engines
- describe the reasons for exhaust particulate filter cleansing activities
- describe types of visibility aids and what factors can affect effective vision
- explain where and why effective vision is extremely important
- give examples of where poor visibility can arise and the issues this can cause
- explain why the warning, and other safety systems, are important
- outline the legal requirements for being on the public highway
- state the purpose of selectable steering and speed modes
- ensure the seatbelt is worn correctly prior to any machine movement – *this should be observed during practical assessment*
- identify and confirm that functional checks for all warning and safety systems have been carried out – *this should be observed during practical assessment*
- ensure that vision systems are in place, clear and functional – *this should be observed during practical assessment*
- conduct all-round visibility checks before moving away – *this should be observed during practical assessment*

travel and manoeuvre the excavator safely across varying terrain and inclines

Delivery to include:

- how travel speeds affect wheeled excavator chassis longevity
- how travel speeds affect excavator stability, safety, and emissions
- issues which can occur if departing from designated travel routes and work areas/restricted zones
- types of underground services and the effects of travelling near to/over services
- effects of travelling close to edges, embankments, structures, and trenches
- travelling over various types of terrain
- effects of direction changes in various steering modes for example, rear steering, front steering, and all-axle steering
- travelling up, down and across inclines
- how certain types of surfaces can affect traction, particularly on inclines
- how uncompacted surfaces and inclines affect machine stability, particularly with wheeled types
- precautions, procedures, and dangers when working on stockpiled materials
- effects due to changes of centre of gravity when on inclines
- machine configuration when travelling on and across steep inclines
- direction of travel
- selection of steering modes for given applications
- limitations of axle articulation on uneven surfaces
- precautions and obstructions on travel routes including overhead utilities
- regulative requirements for travelling near to or under overhead power lines
- effects of direction changes in various steering modes including rear steering, front steering, and all axle steering
- limitations of axle articulation on uneven surfaces

Assessment criteria:

- describe the effects on wheel longevity due to travel speed selection modes
- explain how uncompacted surfaces affect machine stability
- describe what a stockpile is and why precautions should be taken when travelling and working on them
- explain why track drive motors should be kept rearwards
- explain procedures for working on stockpiles, and non-compacted surfaces, authorisation, and requirements
- explain how and when the centre of gravity alters on a machine and the effects on its stability
- explain the effects of direction changes when using different steering modes
- describe how certain types of surfaces can affect traction, particularly on inclines
- state how travel speeds affect excavator stability, safety, and emissions
- describe issues which can occur if departing from designated travel routes and work areas/restricted zones
- describe types of underground services and the effects of travelling near to/over services

- explain the effects of travelling close to edges, embankments, structures, and trenches
- explain how axle oscillation can affect stability and traction
- demonstrate safe travel over rough, undulating ground, inclines, and level surfaces – *this should be observed during practical assessment*
- demonstrate safe travel speeds in accordance with terrain and environment – *this should be observed during practical assessment*
- face the direction of travel – *this should be observed during practical assessment*
- travel up and down a gradient – *this should be observed during practical assessment*
- stop and start on the gradient whilst travelling uphill – *this should be observed during practical assessment*
- stop and start on the gradient whilst travelling downhill – *this should be observed during practical assessment*
- track through a chicane which requires left- and right-hand turns
- manoeuvre the excavator through a chicane, applying the full steering range in both forward and reverse direction – this should be observed during practical assessment
- travel over rough, undulating ground, inclines, level surfaces– *this should be observed during practical assessment*
- manoeuvre the excavator through a restriction either side of the wheels – this should be observed during practical assessment
- maintain full visibility and look at or face direction of travel – *this should be observed during practical assessment*
- avoiding contact with structures and objects - *this should be observed during practical assessment*
- explain how axle oscillation can affect steering and traction

Assessment requirements:

- the slope must have an incline of 18% (1:5.5) with sufficient manoeuvring area at the top, or a straight ramp with an up and down route with a flat area at the summit
- when manoeuvring through the chicane and restriction, there must be minimal clearance to ensure accuracy of steering

travel and manoeuvre in areas of restricted space

Delivery to include:

- precautions to be taken when manoeuvring in areas of restricted space
- requirements when working alongside highways, railways, and public areas
- height and slew restriction limiters
- checking machine size including height, width and working radius including tail swing relevant to working area
- lighting requirements and issues that may occur due to poor light

Assessment criteria:

- describe typical proximity hazards when in enclosed/restricted areas

- explain the factors to consider before entering areas of restricted space
- explain the factors to consider when setting up to work next to highways, footpaths, areas of public movement, railways
- explain the purpose and use of movement restrictors including height, radius, and slew
- explain the potential risks of the tail swing of a machine in a restricted space
- explain the control measures to reduce risk caused by tail swing in a restricted space
- describe how poor lighting can affect overall safety

attach and remove buckets, using quick-hitch couplers

Delivery to include:

- types of excavating and grading buckets
- removal and attachment of buckets/attachments
- classifications of quick-hitch couplers
- procedures for the removal and fitting of attachments using manual and hydraulically operated quick-hitch couplers, including coupling, securing, and checking to ensure safe attachment
- relevant health and safety legislation and legal duties
- risks associated with quick-hitch couplers, including external intervention/support from others
- visual inspections
- maintenance and storage
- exclusion zone requirements, with all personnel clear of the attachment change area

Assessment criteria:

- list the classifications of quick-hitch couplers
- describe the required procedures for removing and fitting attachments using manual and hydraulically operated quick-hitch couplers that ensures safe attachment
- outline the relevant health and safety requirements applicable to the operation of quick-hitch couplers and the legal duties of operators
- identify the risks associated with fitting attachments using quick-hitch couplers, including external intervention
- describe why an exclusion zone is required for the changing of attachments
- describe why others should not intervene in the changing of attachments
- explain the consequences of incorrect fitment of attachments
- conduct visual inspections of quick-hitch couplers – pre-use and after attaching - *this should be observed during practical assessment*
- attach, secure, and detach at least one attachment using a quick-hitch coupler following manufacturer's instructions - *this should be observed during practical assessment*
- apply safe working practices when coupling and disconnecting an attachment using a quick-hitch coupler - *this should be observed during practical assessment*
- explain the procedures for maintaining quick-hitch couplers

conduct all necessary safety checks at the work area

Delivery to include:

- safety checks that must be carried out to ensure the excavation area is clear of hazards
- communication and relationship requirements and methods with other machine operators and support workers
- requirements for sufficient manoeuvring area for manoeuvring between work areas
- ground conditions for excavating and maintaining stability
- overhead obstructions and nearby proximity hazards
- awareness of other machines and workers
- restricted, segregation and exclusion zoning requirements
- people/plant interface, procedures, and dangers of allowing others near to a working machine
- danger zones of a working excavator
- working in hours of darkness and lighting requirements

Assessment criteria:

- explain the need for restricted, exclusion and segregation zones and how they are determined
- describe the safety checks that must be carried out to ensure the excavation area is clear of hazards
- describe the types of ground conditions including seasonal that can affect safe operations
- describe the methods of preventing contact with overhead lines
- describe the need for having sufficient manoeuvring space within the work area
- explain the importance of being aware of other machines, vehicles, and workers
- explain the procedures and dangers of allowing others near to a working machine
- identify the danger zones around the working machine for others
- ensure ground conditions are suitable for excavating and maintaining stability – *this should be observed during practical assessment*
- identify any overhead obstructions and nearby proximity hazards – *this should be observed during practical assessment*
- ensure the integrity of restricted zones – *this should be observed during practical assessment*
- explain procedures for working in hours of darkness and lighting requirements
- identify and use designated excavation area entry and exit locations – *this should be observed during practical assessment*
- ensure loading areas are clear of hazards – *this should be observed during practical assessment*
- establish communication methods with supporting workers – *this should be observed during practical assessment*

configure and set-up for excavating and loading duties

Delivery to include:

- working radius – minimum to maximum
- required configuration for intended activity
- methods of relaying and interpreting excavation work specification

- visual reference points for excavation work
- temporary works requirements and efficiencies of working safely on raised platforms
- where spoil can and should not be placed
- why segregation of materials should be maintained
- positioning of excavator and vehicles for loading
- use of blades and stabilisers to maintain stability
- effects and limitations of stabiliser use in soft ground, uncompacted ground or finished surfaces
- deployment of axle oscillation locks
- selection of correct bucket to meet work specification
- the effects and limitations of stabiliser usage in soft ground, uncompacted ground, and finished surfaces
- the deployment of axle oscillation locks

Assessment criteria:

- explain how to establish the working range of the machine
- describe the types and methods of communication that are used to convey excavation and other work criteria to the operator
- explain types of site markings for excavations, what they mean and how they are interpreted
- outline regulatory requirements for working on temporary raised platforms
- explain where spoil should be placed for different types of excavations and effects of placing spoil in incorrect places
- explain why excavated materials may need to be segregated and where they are placed
- explain how dozing blades and stabilisers aid stability
- explain how to, and methods of, preventing damage to finished surfaces through stabiliser use
- explain why axle oscillation lock devices should be engaged for excavator use
- position and set up the machine for given excavating tasks – *this should be observed during practical assessment*

explain actions required for hazards, to include underground and overhead services

Delivery to include:

- regulatory requirements for working near to or under overhead services
- types of services, including buried and surface laid, and the various methods on how they are identified
- emergency and reporting procedures if contact is made with services
- minimum clearances when near to services
- permit to break ground requirements

Assessment criteria:

- explain regulative distances that machines should be kept from different types of overhead services

- describe the types of services that may be encountered on site
- explain the emergency and evacuation procedures if contact is made with services on site
- state the minimum distances to be kept from buried and surface laid services
- explain methods and hierarchy of establishing buried services within the work area
- explain how and why contact to services must be reported
- explain why permits to break ground are required, who issues them and on what basis

excavate different types of excavations in various types of ground to given dimensions

Delivery to include:

- typical types of excavations able to be created by 360° excavators
- how soil types determine excavation types and methods, including unexpected uncovering of contaminated material
- methods of minimising excavation collapse including benching, trench boxes, other shoring, and support methods and other related methods
- causes of excavation collapse
- method statements, job specifications, risk assessments,
- placement or disposal of spoil
- segregation of excavated materials
- typical excavation tolerances
- reasons for excavation dimensions and effects of not conforming to given tolerances
- methods of efficient excavation techniques for different types of ground and support requirements
- carrying out a range of excavating activities following given dimensions and tolerances
- working near to edges and deep excavations
- potential sinkage of stabiliser pads in soft ground
- required control methods for open excavations
- methods of establishing excavation dimensions and tolerances
- establishing and maintaining visual contact with dedicated supporting workers

Assessment criteria:

- describe types and purposes of typical construction-based excavation
- explain how excavations should be carried out on differing soil types for example, granular, and cohesive
- describe causes of excavation collapse and effects of environmental conditions – dryness/high moisture
- explain the methods of minimising excavation collapse and methods of shoring
- explain what methods are used to transfer excavation specifications and requirements to the operator
- explain the reason for segregation of different soil types and how they should be segregated during excavation
- explain the reasons for limiting off-site disposal of spoil

- state the typical excavation tolerances in construction excavations and explain the effects of not conforming to given tolerances
- explain the effects of using stabilisers in soft ground whilst excavating
- describe methods of efficient excavation techniques for different types of ground
- explain the importance of maintaining visual contact with dedicated supporting workers
- on level ground excavate a straight excavation with vertical ends to given dimensions and tolerances – *this should be observed during practical assessment*
- excavate a square excavation to given dimensions and tolerances – *this should be observed during practical assessments*

Assessment requirements:

- the length of the excavation will be determined by the machine weight as follows:
    - below 10 tonnes – 10 metres
- the square box must be 3x the width of the bucket
- excavation and box depths must be a minimum of 1 metre and be within +/- 35mm of the given size
- the excavation must be straight within +/- 60mm

place materials into transporting vehicles and hoppers

Delivery to include:

- types of transporting vehicle typically loaded by 360° excavators
- visibility requirements for loading purposes including being on raised platforms and stockpiles
- transporting vehicle positioning for loading and how this varies with type
- communication methods – signals and other related methods
- positioning of excavator for loading
- maintaining safety and stability of transporting vehicle during loading
- sequence of loading a vehicle
- effects of the density of a material when loading
- how incorrect loading can cause stability issues for transporting vehicle
- effects and implications of overloading, including heaped loads on a range of typical transporting vehicles
- vision issues of overloading front-facing skip/body types
- safe positioning of loading vehicle driver prior to loading
- efficient methods of loading vehicles to capacity
- definition of ‘heaped’ and ‘struck’ capacities
- carrying out loading activities to capacity of various transporting vehicle types

Assessment criteria:

- state the types of transporting vehicle which are typically loaded by 360° excavators within construction activities
- explain how visibility can be improved when loading high-sided vehicles
- state requirements for constructing and working on raised platforms and stockpiles and what issues can occur
- describe the considerations for positioning of the excavator in relation to various transporting vehicle types for loading activities
- explain the types of communication methods for loading activities
- explain the causes of lateral and longitudinal instability and vision issues of a transporting vehicle when being loaded
- outline the differences between heaped and struck loads and the effects of having heaped loads on a range of transporting vehicles
- explain why the sequence of loading a vehicle is important and how the density of a material can affect loading procedures
- explain the potential effects (safety, legal and commercial) of overloading and underloading a transporting vehicle
- explain where the driver of the loading vehicle should be stationed prior to loading on a range of vehicle types
- load material into a transporting vehicle to capacity – *this should be observed during practical assessments*

Assessment requirements:

- the loading vehicle must require at least 5 x bucket loads to be filled to the capacity
- the vehicle must be loaded and discharged at least twice

reinstate excavation – grade, spread and level ground and materials

Delivery to include:

- the importance of ground compaction and settlement
- methods of grading and spreading various types of soil
- use of grading buckets and blades
- method statements, risk assessments for grading and levelling purposes
- types of attachments for grading and levelling activities
- methods of establishing grading and levelling dimensions and tolerances
- carrying out grading and levelling activities following given dimensions and tolerances
- the protection of installed services

Assessment criteria:

- describe how ground compaction, settlement and void elimination is catered for following reinstatement activities
- explain the purposes of grading and how various material types should be spread
- state the types of grading buckets and explain the use of grading blades to level surfaces

• state why method statements and risk assessments are required for grading and levelling activities • state other types of attachments for grading and levelling activities • explain how grading and levelling tolerances are established • backfill and reinstate previous excavations back to original level – *this should be observed during practical assessments* • explain the protection of installed services
explain environmental considerations of machine use *Delivery to include:* • health and social reasons to reduce machine emissions • government industry zero emission initiatives • what 'tailpipe' emissions are caused by compression ignition (CI) diesel engines during internal combustion • air quality and the component gases of air • how engine emissions, including particulate matter, affect air quality and the effects on human and environmental wellbeing • measures to reduce emissions during operations including alternative/low emission fuels, fuel treatments and particulate filtration systems • efficient use of the machine and when and how minimising engine use can aid air quality and fuel savings • eco-friendly oils, fluids, and lubricants • fuel-saving techniques for specific item of plant • appropriate disposal of waste • spillage procedures *Assessment criteria:* • explain the health and social reasons for reducing machine emissions • discuss government industry zero emission initiatives • list two or more effects on human and environmental wellbeing as a result of engine emissions • identify measures to reduce emissions on site • explain appropriate disposal of waste • explain spillage procedures • describe the need to keep engine speed and load to a minimum whilst maintaining working efficiency
explain loading/unloading procedures for machine transportation *Delivery to include*: • procedures for preparing the machine for loading onto a transporter • traction and surface preparation requirements

- understanding of agreed methods of communication between the plant operator and others
- working at height requirements when driving onto or off a transporter bed

Assessment criteria:

- describe the preparation required of both machine and transporter for loading and unloading of the machine
- explain the precautions to be taken when driving the machine onto and off the transporter bed
- state the methods of communication between the plant operator and others
- describe the dangers of and requirements for working at height when on the vehicle bed

carry out all end of work and shut down procedures

Delivery to include:

- types of safe locations, areas, and ground/terrain types where an excavator may be parked and should not be parked
- reasons for ensuring safe parking and unintentional movement and ground support requirements
- carrying out parking, shut down and isolation requirements according to manufacturer's instructions
- reasons for machine isolation including security and non-authorised use by others
- use of anti-vandalism equipment

Assessment criteria:

- demonstrate and explain safe parking of the machine - machine is parked in a safe, designated location, clear of hazards on level, firm ground - *this should be observed during practical assessment*
- apply brake systems effectively
- demonstrate how to isolate and secure the machine to prevent non-authorised use and explain why this is important - *this should be observed during practical assessment*
- describe the use of anti-vandalism equipment
- explain the need for operators to remove debris/packed earth from undercarriage components