

Curriculum

For

“Digging

Operation/Technology”

(Digger/Excavator Operator)

(Level -3)



25th to 29th October 2021



**National Vocational & Technical
Training Commission**

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Introduction

Definition/ Description of the training programme for *Digging Operation Supervisor*

There is an increasing demand of the Digging Operation Supervisor in civil construction or mining industry. If an individual is planning to pursue a career in Digging or Excavation, this program will be helpful in targeting various industries including civil construction or mining, etc.

Purpose of the Training Programme

The purpose of this training is to develop a range of skills and techniques, personal skills and attributes essential for successful performance in civil construction or mining sector in accordance with industry requirements. Graduates of this program may find employment in local and international industries.

Overall objectives of training programme

The main objective of this training program is to improve the employability of young graduates through qualifying job-related training in the Digging/Excavation sector, and to train them so that they can prove to be an asset to this sector.

Competencies to be gained after completion of course

- **A-** Identify and implement Workplace Policies and Procedures
- **B-** Apply work health and safety practices (WHS)
- **C-** Communicate at workplace
- **D-** Perform Basic Computer operations
- **E-** Perform Pre-digging tasks
- **F-** Operate Digging Machine/Excavator
- **G-** Perform Digging/Excavation Operation
- **H-** Perform Maintenance of digging equipment
- **I-** Perform Advance Technical Drawing

Possible available job opportunities available immediately and later in the future

- Digger Operator
- Engine Mechanic
- Auto Electrician

Trainee Entry Level

For National Vocational Certificate Level-3 in “Digger/Excavator Operator” (Digging Operation Supervisor), the entry requirement is award of National Vocational Certificate Level-2 in “Assistant Digger Operator”.

Minimum Qualification of Trainer

Teaching staff should have DAE with two years’ or 2 years Certificate with five years’ experience in Digging/Excavation. They should also hold or be working towards a formal teaching qualification.

Other formal qualifications in the Civil Construction or Mining would be useful in addition to the above.

Recommended Trainer: Trainee Ratio

The recommended maximum trainer: trainee ratio for this programme is 1 trainer for 25 trainees.

Medium of Instruction I.E. Language of Instruction

Instruction will be Urdu and English.

Duration of the Course (Total Time, Theory & Practical Time)

This curriculum comprises 09 modules. The recommended delivery time is 600 hours. Delivery of the course could therefore be full time, 5 days a week. Training providers are at liberty to develop other models of delivery, including part-time and evening delivery.

The full structure of the course is as follow:

Module	Theory ¹ Days/hours	Workplace ² Days/hours	Total hours
Module 1: Identify and implement Workplace Policies and Procedures	10	10	20
Module 2: Apply work health and safety practices (WHS)	20	10	30
Module 3: Communicate at workplace	20	10	30
Module 4: Communicate at workplace	20	30	50
Module 5: Perform Basic Computer operations	10	40	50
Module 6: Operate Digging Machine/Excavator	20	90	110
Module 7: Perform Digging/Excavation Operation	40	100	140
Module 8: Perform Maintenance of digging equipment	20	50	70
Module 9: Perform Advance Technical Drawing	20	80	100

¹ Learning Module hours in training provider premises

² Training workshop, laboratory and on-the-job workplace

Sequence of the Modules

Each module covers a range of learning components. These are intended to provide detailed guidance to teachers (for example the Learning Elements component) and give them additional support for preparing their lessons (for example the Materials Required component). The detail provided by each module will contribute to a standardized approach to teaching, ensuring that training providers in different parts of the country have clear information on what should be taught. Each module also incorporates the industrial needs of Pakistan.

The distribution table is shown below:

Module 2: Apply work health and safety practices (WHS) 30 Hours		
Module 1: Identify and implement Workplace Policies and Procedures 20 Hours	Module 4: Perform Pre-digging tasks 50 Hours	Module 3: Communicate at workplace 30 Hours
	Module 5: Operate Digging Machine/Excavator 110 Hours	
	Module 6: Perform Digging/Excavation Operation 140 Hours	
	Module 7: Perform Maintenance of digging equipment 70 Hours	
Module 8: Perform Advance Technical Drawing 100 Hours		
Module 9: Perform Basic Computer operations 50 Hours		

Summary – overview of the curriculum

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 1: Identify and Implement Workplace policies and Procedures Aim: After successful completion of this module, the trainee is competent in Identifying and Implement Workplace policies and Procedures	LU1: Identify workplace policy & procedures LU2: Implement workplace policy & procedures LU3: Communicate workplace policy & procedures LU4: Review the implementation of workplace policy & procedures	10	10	20
Module 2: Apply Work Health and Safety Practices (WHS) Aim: After successful completion of this module, the trainee is competent in Applying Work Health and Safety Practices (WHS)	LU1: Implement safe work practices at work place LU2: Participate in hazard assessment activities a work place LU3: Follow emergency procedures at workplace LU4: Participate in OHS consultative processes	20	10	30

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 3: Communicate at Workplace Aim: After successful completion of this module, the trainee is competent in Communicating at Workplace	LU1: Communicate within the organization LU2: Communicate outside the organization LU3: Communicate effectively in work group LU4: Communicate in writing	20	10	30
Module 4: Perform Basic Computer operations Aim: After successful completion of this module, the trainee is competent in performing Basic Computer operations	LU1: Configure Computer System LU2: Create a Document using MS Word LU3: Preparer a Worksheet using MS Excel LU4: Prepare a presentation using MS PowerPoint	20	30	50

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 5: Perform Pre-digging tasks Aim: After successful completion of this module, the trainee is competent in performing Pre-digging tasks	LU1: Perform Initial preparatory activities LU2: Prepare the work site LU3: Perform pre-checking of equipment	10	40	50
Module 6: Operate Digging Machine/Excavator Aim: After successful completion of this module, the trainee is competent in Operating Digging Machine/Excavator	LU1: Operate Crawler Excavator LU2: Operate Wheeled Excavator	20	90	110

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 6: Perform Digging/Excavation Operation Aim: After successful completion of this module, the trainee is competent in performing Digging/Excavation Operation	LU1: Perform preparatory activities LU2: Perform Digging/Excavation LU3: Perform post digging/ Excavation activities	40	100	140
Module 8: Perform Basic Maintenance of digging equipment Aim: After successful completion of this module, the trainee is competent in performing Basic Maintenance of digging equipment	LU1: Perform pre-checking of machine/equipment LU2: Inspect machine/equipment for fault detection LU3: Perform Basic maintenance of machine/equipment	20	50	70

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 9: Perform Advance Technical Drawings Aim: After successful completion of this module, the trainee is competent in performing Advance Technical Drawings	LU1: Explore types of dimensioning and symbols LU2: Develop Building Drawings LU3: Draw Sections	20	80	100

Modules

Module 1: Identify and Implement Workplace policies and Procedures

Objective of the module: The aim of this module to get knowledge, skills and understanding to Identify and Implement Workplace policies and Procedures

Duration: 20hours **Theory:** 10 hours **Practical:** 10 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Identify workplace policy & procedures	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify the workplace policy & procedures 2. Apply appropriate strategies that can be used to measure whether your workplace health and safety obligations are being met. 3. Assure the policies are realistic, resources and personnel to implement 4. Implement the policy & procedures that reflects the organizations commitments 5. Ensure the appropriate methods of implementation, 	<ul style="list-style-type: none"> • Define the workplace policy & procedures • Enlist the strategies for workplace health and safety obligations • Explain the workplace policies , resources and personnel • Describe the methods of implementation, outcomes and performance indicators 	Total: 05hrs Theory: 02hrs Practical: 02hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system 	Class room

	outcomes and performance indicators				
LU2: Implement workplace policy & procedures	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Apply and assign responsibility for recording systems to track continuous improvements in policy & procedures 2. Implement strategies for continuous improvement in effective and efficient information 	<ul style="list-style-type: none"> • Explain the procedures of Implementation of strategies for continuous improvement 	<p>Total: 05hrs Theory: 02hrs Practical: 02hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners <p>Non Consumable</p> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • PPEs (Safety glasses, Ear muffs/ear plugs, Protective Gloves, Cap, Safety shoes etc.) 	Class room
LU3: Communicate workplace policy & procedures	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Communicate procedures to help implement workplace policy 		<p>Total: 05hrs Theory: 03hrs Practical: 03hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers 	Class room

	<p>2. Inform those involved in implementing the policy about expected outcomes, activities to be undertaken and assigned responsibilities</p>	<ul style="list-style-type: none"> Define the Communication procedures to help implement workplace policy 		<ul style="list-style-type: none"> Sharpeners <p>Non Consumable</p> <ul style="list-style-type: none"> White board Multimedia Internet Computer system Safety manuals 	
<p>LU4: Review the implementation of workplace policy & procedures</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> Identify the trends that may require remedial actions Record the trends that may require remedial actions Ensure policy and procedures as required are made for continuous improvement of performance 	<ul style="list-style-type: none"> Describe the trends for required remedial actions 	<p>Total: 05hrs Theory: 03hrs Practical: 03hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners <p>Non Consumable</p> <ul style="list-style-type: none"> White board Multimedia Internet Computer system 	Class room

Module 2: Apply Work Health and Safety Practices (WHS)

Objective of the module: The aim of this module to get knowledge, skills and understanding to Apply Work Health and Safety Practices (WHS)

Duration: 30 hours **Theory:** 20 hours **Practical:** 10hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Implement safe work practices at work place	The trainee will be able to: <ol style="list-style-type: none"> 1. Implement relevant rules and procedures of WHS at work place 2. Comply with duty of care requirements 3. Use personal protective equipment according to safe work practices 4. Contribute to WHS consultative activities 5. Raise WHS issues with relevant personnel 	<ul style="list-style-type: none"> • Explain the WHS rights and responsibilities that apply to own role • Explain the term duty of care 	Total: 07hrs Theory: 05hrs Practical: 02hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pen Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system 	Class Room
LU2: Participate in hazard assessment activities a work place	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify hazards or WHS issues in the workplace to relevant personnel 2. Assess and control risks according to own level of 	<ul style="list-style-type: none"> • List and describe common safety signs and symbols 	Total: 08hrs Theory: 05hrs Practical: 03hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pen Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet 	Class Room

	<p>responsibility, in line with workplace procedures</p> <ol style="list-style-type: none"> Report hazards or WHS issues in the workplace to relevant personnel Document risk control actions as required 			<ul style="list-style-type: none"> Computer system 	
LU3: Follow emergency procedures at workplace	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> Report emergencies or incidents promptly to relevant personnel Deal with emergencies in line with own level of responsibility Implement evacuation procedures as required 	<ul style="list-style-type: none"> Describe typical health and safety roles in the workplace Enlist emergencies or incidents relevant personnel Define evacuation procedures at workplace 	<p>Total: 07hrs Theory: 05hrs Practical: 02hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> Notebooks Pen <p>Non Consumable</p> <ul style="list-style-type: none"> White board Multimedia Internet Computer system 	Class Room
LU4: Participate in OHS consultative processes	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> Contribute to workplace meetings, inspections or other consultative activities Raise OHS (Occupational Health and Safety) issues with designated persons in accordance with organizational procedures 	<ul style="list-style-type: none"> Importance of workplace meetings, inspections or other consultative activities Enlist common OHS (Occupational Health and Safety) issues with accordance to the organizational procedures 	<p>Total: 08hrs Theory: 05hrs Practical: 03hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> Notebooks Pen <p>Non Consumable</p> <ul style="list-style-type: none"> White board Multimedia Internet Computer system 	Class Room

	3. Take actions to eliminate workplace hazards or to reduce risks	<ul style="list-style-type: none"> Describe actions to eliminate workplace hazards or to reduce risks 			
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Module 3: Communicate at Workplace

Objective of the module: The aim of this module to get knowledge, skills and understanding to Communicate at Workplace.

Duration: 30 hours **Theory:** 10 hours **Practical:** 20 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Communicate within the organization	The trainee will be able to: <ol style="list-style-type: none"> 1. Communicate within a department 2. Communicate with other departments 3. Use various media to communicate effectively 4. Communicate orally and written 	<ul style="list-style-type: none"> • Importance of intra and inter organizational communication • Types of Modes of communication • 8C's of communication 	Total: 08hrs Theory: 03hrs Practical: 05hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system 	Class Room/ Simulated environment
LU2: Communicate outside the organization	The trainee will be able to: <ol style="list-style-type: none"> 1. Deal with vendors 2. Deal with clients/customers 3. Interact with other organisations 4. Use various media to communicate effectively 5. Work with people of different cultures / 	<ul style="list-style-type: none"> • Basics of business communication • Importance of communication with clients/customers/vendor 	Total: 08hrs Theory: 03hrs Practical: 05hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet 	Class Room/ Simulated environment

	backgrounds			<ul style="list-style-type: none"> • Computer system • PPEs (Safety glasses, Ear muffs/ear plugs, Protective Gloves, Cap, Safety shoes etc.) 	
LU3: Communicate effectively in work group	The trainee will be able to: <ol style="list-style-type: none"> 1. Assess the issues to provide relevant suggestion to group members 2. Resolve the issues/problems /conflicts within the group 3. Arrange group working sessions to increase the level of participation in the group processes 4. Communicate messages to group members clearly to ensure interpretation is valid 	<ul style="list-style-type: none"> • Explain the method of Communication in work group • Importance of communication style/manner • Method of feed back <ul style="list-style-type: none"> ○ Verbal ○ Written etc. • Types of feed back <ul style="list-style-type: none"> ○ Informal ○ Formal ○ Formative ○ Summative etc. 	Total: 07hrs Theory: 02hrs Practical: 05hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Safety manuals 	Class Room/ Simulated environment

	<p>5. Communicate style /manner to reflect professional standards/ awareness of appropriate cultural practices</p> <p>6. Act upon constructive feedback</p>				
<p>LU4:</p> <p>Communicate in writing</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Identify relevant procedures for written information 2. Use strategies to ensure correct communication in writing .i.e. <ul style="list-style-type: none"> • Correct composition • Clarity • Comprehensiveness • Accuracy • Appropriateness 3. Draft assigned written information for approval, ensuring it is written within designated timeframes 4. Ensure written information meets required standards of style, format and detail 5. Seek assistance / 	<ul style="list-style-type: none"> • Define procedures for written information <p>Importance of communication strategies in writing</p>	<p>Total: 07hrs</p> <p>Theory: 02hrs</p> <p>Practical: 05hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners <p>Non Consumable</p> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • PPEs (Safety glasses, Ear muffs/ear plugs, Protective Gloves, Cap, Safety shoes etc.) 	<p>Class Room/ Simulated environment</p>

	feedback to aid communication skills development				
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Module 4: Perform Basic Computer Operations

Objective of the module: After successful completion of this module, the trainee is competent in performing Basic Computer Operations.

Duration: 50 hours **Theory:** 20 hours **Practical:** 30 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Configure Computer System	The trainee will be able to: <ol style="list-style-type: none"> 1. Connect computer components and peripherals as per requirement. 2. Install Drivers and applications according to the software specification. 3. Troubleshoot Applications to trace and fix faults in a specific application to bring it in a running condition. 	<ul style="list-style-type: none"> • Introduction to hardware and software • Introduction to configuring computer • Install and Configure a Computer System • Introduction to troubleshooting • Types of troubleshooting 	Total: 10hrs Theory: 05hrs Practical: 05hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Pocket files • Notebooks • Pencils • Erasers • Sharpeners <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system 	Class room/Computer Lab
LU2. Create a Document using MS Word	The trainee will be able to: <ol style="list-style-type: none"> 1. Compose a document as per the requirement. 2. Format Word Document according to given requirements. 3. Print Word Documents 	<ul style="list-style-type: none"> • Introduction to MS Word • Creating a file in MS Word • Uses of Templates in MS Word 	Total: 13hrs Theory: 05hrs Practical: 08hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Pocket files • Notebooks • Pencils • Erasers • Sharpeners <div>Non Consumable</div>	Class room/Computer Lab

	according to requirements.	<ul style="list-style-type: none"> • File and types of files • Creating and printing different documents in MS Word 		<ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system 	
LU3. Prepare a Worksheet using MS Excel	The trainee will be able to: <ol style="list-style-type: none"> 1. Develop a worksheet as per given data. 2. Format the worksheet according to given criteria. 3. Apply Formulas according to the requirement. 4. Generate Charts/Graphs according to the given data. 	<ul style="list-style-type: none"> • Introduction to MS Excel • Creating a worksheet in MS Excel • Uses of Templates in MS Excel • Formulas for calculations • Adding Graphs in MS Excel sheet • Creating and printing different documents in MS Excel 	Total: 14hrs Theory: 05hrs Practical: 09hrs	Consumable <ul style="list-style-type: none"> • Pocket files • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system 	Class room/Computer Lab
LU4. Prepare a presentation using MS PowerPoint	The trainee will be able to: <ol style="list-style-type: none"> 1. Insert Slides with different Layouts according to requirements of presentation. 2. Insert text, tables, images, etc. according to the requirement. 	<ul style="list-style-type: none"> • Introduction to MS PowerPoint • Creating a presentation in MS PowerPoint • Uses of Templates in MS PowerPoint • Setting the transitions for slides 	Total: 13hrs Theory: 05hrs Practical: 08hrs	Consumable <ul style="list-style-type: none"> • Pocket files • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board 	Class room/Computer Lab

	<ol style="list-style-type: none"> 3. Apply a set of effects to animate the slide according to requirement. 4. Apply Slide Transitions on Slides according to requirement. 5. Apply Sound Effects on Objects/text/images according to requirement. 6. Present a presentation according to 7Cs of communication. 	<ul style="list-style-type: none"> • Presentation of slides 		<ul style="list-style-type: none"> • Multimedia • Internet • Computer system 	
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Module 4: Perform Pre-digging tasks

Objective of the module: The aim of this module to get knowledge, skills and understanding to perform Pre-digging tasks

Duration: 50 hours

Theory: 10 hours

Practical: 40 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Perform Initial preparatory activities	The trainee will be able to: <ol style="list-style-type: none"> 1. Interpret Work order/Requisition 2. Interpret excavation drawing/sketch 3. Plan task sequences for optimum efficiency 4. Select PPEs according to the requirement 5. Ensure the issuance of Permit To Work (PTW) 	<ul style="list-style-type: none"> • Work order • Technical drawings • Task Planning • Personal Protective Equipment (PPEs) • Work Permit (PTW) 	Total: 13hrs Theory: 03hrs Practical: 10hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • White board Marker 	<ul style="list-style-type: none"> • Class Room • Workshop
		Practical Activity: <ol style="list-style-type: none"> 1. Select PPEs according to the given task. 2. Interpret given technical drawing and plan task sequence accordingly. 		Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • PPEs' 	

LU2: Prepare the work site	The trainee will be able to: <ol style="list-style-type: none"> 1. Barricade the work area to prevent unauthorised entrance 2. Identify different types of Soils and rocks 3. Identify hazards at worksite and suggest a mitigation plan 	<ul style="list-style-type: none"> • Procedure to Barricade the site area • Signs and Signals • Types of Soils and rocks • Mitigation Plan • Occupational Health, Safety and Environment (OHSE) Practical Activity: <ol style="list-style-type: none"> 1. Barricade the assigned site area and place warning signs for safety and to prevent unauthorised entrance 2. Identify hazards at worksite and suggest a mitigation plan 	Total: 26hrs Theory: 06hrs Practical: 20hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • PPEs' <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Measuring tools 	<ul style="list-style-type: none"> • Class Room • Site Area
LU3: Perform pre-checking of equipment	The trainee will be able to: <ol style="list-style-type: none"> 1. Select machinery/equipment according to the work order 	<ul style="list-style-type: none"> • Types of digging/excavation equipment • Maintenance tools • Inspection checklists 	Total: 13hrs Theory: 03hrs Practical: 10hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers 	<ul style="list-style-type: none"> • Class Room • Workshop

	<ol style="list-style-type: none"> 2. Perform inspection of selected machinery/equipment according to the SOPs 3. Ensure the availability of toolbox 	Practical Activity: <ol style="list-style-type: none"> 1. Perform inspection and maintain the tool box according to the given checklist. 2. Select machinery/equipment according to the given task and also perform pre-activity inspection. 		<ul style="list-style-type: none"> • Sharpeners • Pen • PPEs' <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Measuring tools • Tool Kit 	
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Module 5: Operate Digging Machine/Excavator

Objective of the module: The aim of this module to get knowledge, skills and understanding to Operate Digging Machine/Excavator

Duration: 110 hours

Theory: 20 hours

Practical: 90 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1:Operate Crawler Excavator	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify Crawler Excavator 2. Identify components of Excavator 3. Start and shut down the Crawler Excavator 4. Use different components (Boom, arm, bucket, etc.) of Crawler Excavator 5. Use different controls (Forward, reverse, etc.) of Crawler Excavator 6. Use control panel of Crawler Excavator 	<ul style="list-style-type: none"> • Introduction to the Excavations • Types of Excavators (Crawler, Wheeler, long-reach, Dragline, Suction, etc.) • Parts of Crawler Excavator • Attachments of Crawler Excavator • Functions of different parts of Crawler excavator • Work equipment of Crawler excavator • Role of Banksman and interpretation of signs, signals and markings 	Total: 55hrs Theory: 10hrs Practical: 45hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Measuring tools 	<ul style="list-style-type: none"> • Class Room/Work Area

	<ol style="list-style-type: none"> 7. Attach/detach different attachments (Buckets, Auger, Breaker, etc.) of Crawler Excavator 8. Coordinate with the banksman 9. Mobilise the excavator according to the given instructions 	Practical Activity: <ol style="list-style-type: none"> 1. Label the diagram of Crawler excavator 2. Attach/detach different attachments of Crawler Excavator 3. Mobilise the excavator in accordance with banksman 		<ul style="list-style-type: none"> • Crawler Excavator • Excavator attachments • PPEs' 	
LU2: Operate Wheeled Excavator	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify Wheeled Excavator 2. Identify components of Excavator 3. Start and shut down the Wheeled Excavator 4. Use different components (Boom, arm, bucket, etc.) of Wheeled Excavator 5. Use different controls (Forward, reverse, etc.) of 	<ul style="list-style-type: none"> • Parts of Wheeled Excavator • Attachments of Wheeled Excavator • Functions of different parts of Wheeled excavator • Work equipment of Wheeled excavator • Role of Banksman and interpretation of signs, signals and markings 	Total: 55hrs Theory: 10hrs Practical: 45hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet 	<ul style="list-style-type: none"> • Class Room/Work Area

	<p>Wheeled Excavator</p> <ol style="list-style-type: none"> 6. Use control panel of Wheeled Excavator 7. Attach/detach different attachments (Buckets, Auger, Breaker, etc.) of Wheeled Excavator 8. Coordinate with the banksman 9. Mobilise the excavator according to the given instructions 	<p>Practical Activity:</p> <ol style="list-style-type: none"> 1. Label the diagram of Wheeled excavator 2. Attach/detach different attachments of Wheeled Excavator 3. Mobilise the Wheeled excavator in accordance with banksman 		<ul style="list-style-type: none"> • Computer system • Measuring tools • Wheeled Excavator • Excavator attachments • PPEs' 	
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Module 6: Perform Digging/Excavation Operation

Objective of the module: The aim of this module to get knowledge, skills and understanding to perform Digging/Excavation Operation

Duration: 140 hours

Theory: 40 hours

Practical: 100 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Perform preparatory activities	The trainee will be able to: <ol style="list-style-type: none"> 1. Unload equipment/machinery to the site 2. Perform visual inspection of the equipment after unloading 3. Verify excavation drawing/sketch with actual site condition 	<ul style="list-style-type: none"> • Technical Drawings • Procedure of unloading the equipment/machinery • Visual inspection of the equipment after unloading • PPE's • Benchmarking 	Total: 40hrs Theory: 10hrs Practical: 30hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet 	<ul style="list-style-type: none"> • Class Room/Work Area

	<ol style="list-style-type: none"> 4. Select PPEs according to the requirement 5. Interpret benchmarks 	Practical Activity: <ol style="list-style-type: none"> 1. Unload equipment/machinery on the site. 2. Perform the inspection of equipment/machinery and complete a given checklist. 3. State PPEs according to the task. 		<ul style="list-style-type: none"> • Computer system • Measuring tools • Wheeled Excavator • Crawler Excavator • Excavator attachments • PPEs' 	
LU2: Perform Digging/Excavation	The trainee will be able to: <ol style="list-style-type: none"> 1. Fit appropriate attachment to the equipment according to the job requirement 2. Move the equipment to the worksite 3. Ensure the equipment is levelled 4. Set the work equipment 	<ul style="list-style-type: none"> • Different Techniques of Excavation • Different types of attachment used with excavator • Machine parameter settings • Sequence of operations to achieve the job requirements 	Total: 70hrs Theory: 20hrs Practical: 50hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet 	<ul style="list-style-type: none"> • Class Room/Work Area

	<p>according to the job requirement</p> <ol style="list-style-type: none"> 5. Perform digging operations (digging, moving, dumping, etc.) at the worksite according to the given instructions 6. Monitor equipment performance 7. Coordinate activities with site team 8. Submit the job completion report to the concern person 	<p>Practical Activity:</p> <ol style="list-style-type: none"> 1. Adjust the work equipment according to the assigned task. 2. Perform digging operations at the worksite according to the given task 		<ul style="list-style-type: none"> • Computer system • Measuring tools • Wheeled Excavator • Crawler Excavator • Excavator attachments • PPEs' 	
<p>LU3: Perform post digging/ Excavation activities</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Clear the work area according to the SOPs 2. Ensure the cleanliness of equipment off site according to the SOPs 3. Inspect the equipment according to the SOPs 4. Ensure the closure of Permit To Work (PTW) 	<ul style="list-style-type: none"> • Standard Operating Procedures (SOPs) following post digging/ Excavation activities <ul style="list-style-type: none"> ◦ Site Clearance ◦ Post activity inspection of machinery/equipment ◦ Closure of Permit To Work (PTW) 	<p>Total: 30hrs Theory: 10hrs Practical: 20hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • White board Marker <p>Non Consumable</p>	<ul style="list-style-type: none"> • Class Room/Work Area

		Practical Activity: <ol style="list-style-type: none"> 1. Perform site clearance and ensure the maintenance of machinery/equipment after completing the given task. 2. Perform the closure of PTW as per SOPs. 		<ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Measuring tools • Wheeled Excavator • Crawler Excavator • Excavator attachments • Maintenance Tool kit 	
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Module 7: Perform Basic Maintenance of digging equipment

Objective of the module: The aim of this module to get knowledge, skills and understanding to Perform Basic Maintenance of digging equipment

Duration: 70 hours

Theory: 20 hours

Practical: 50 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Perform pre-checking of machine/equipment	The trainee will be able to: <ol style="list-style-type: none"> 1. Check out the working of Battery 2. Check out the indicators 3. Check Engine coolant level 4. Check Fuel Level 5. Check Engine Oil Level 	<ul style="list-style-type: none"> • Importance of basic Maintenance of digging equipment • Types of alternator windings • Instrument panel gauges and meters • Start up and periodic checks • Measure the insulation resistance of alternator • PPE's. 	Total: 15hrs Theory: 05hrs Practical: 10hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet 	<ul style="list-style-type: none"> • Class Room/Workshop

	<ol style="list-style-type: none"> 6. Check Hydraulic oil level 7. Check tension of track chain 8. Check Air pressure of Tires for wheeled vehicle 9. Inspect Hydraulic Pipes 	Practical Activity: <ol style="list-style-type: none"> 1. Check Engine coolant, fuel and Oil Level of the machine. 2. Check tension of track chain. 3. Inspect Hydraulic Oil levels and Pipes. 4. Check Air pressure of wheeled vehicle using appropriate tool/equipment. 		<ul style="list-style-type: none"> • Computer system • Measuring tools • Wheeled Excavator • Crawler Excavator • Excavator attachments • Maintenance Tool kit • Air pressure Gauge 	
LU2: Inspect machine/equipment for fault detection	The trainee will be able to: <ol style="list-style-type: none"> 1. Test the current with Multimeter 2. Identify different types of gauges 3. Measure the Hydraulic Temperature using Thermistor Kit 4. Measure the Hydraulic 	<ul style="list-style-type: none"> • Maintenance Tool kit • Multimeter • Thermistor kit • Hydraulic temperature and pressure • Vacuum Pressure • Engine Revolution Per Minute (R.P.M) • Electrically simulating faults 	Total: 20hrs Theory: 05hrs Practical: 15hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • White board Marker Non Consumable <ul style="list-style-type: none"> • White board 	<ul style="list-style-type: none"> • Class Room/Workshop

	<p>Pressure using Hydraulic Pressure Gauge</p> <p>5. Measure Compression using compression gauge</p> <p>6. Measure Vacuum Pressure using Vacuum gauge</p> <p>7. Interpret engine R.P.M.</p> <p>8. Prepare and submit Inspection report</p>	<ul style="list-style-type: none"> • Mechanically/Hydraulically simulating faults <hr/> <p>Practical Activity:</p> <p>1. Check machine/equipment, find the faults and defects, also enlist and report findings to the concern person.</p>		<ul style="list-style-type: none"> • Multimedia • Internet • Computer system • Measuring tools • Wheeled Excavator • Crawler Excavator • Excavator attachments • Maintenance Tool kit • Air pressure Gauge • Pressure Gauges • Multimeter • Thermistor kit • Vacuum Gauge 	
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LU3: Perform Basic maintenance of machine/equipment	The trainee will be able to: <ol style="list-style-type: none"> 1. Perform basic Preventive maintenance as per checklist 2. Perform basic Corrective maintenance as per requirement 3. Report the major faults and defects to the supervisor for further action 	<ul style="list-style-type: none"> • Cleaning procedure of all battery cap vents • Tightening procedure of all exhaust connections • Tightening procedure of all electric connections of circuit breakers <hr/> Practical Activity: <ol style="list-style-type: none"> 1. Check machine/equipment, and perform corrective maintenance as per requirement. 	Total: 35hrs Theory: 10hrs Practical: 25hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • White board Marker <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Measuring tools • Wheeled Excavator • Crawler Excavator • Excavator attachments • Maintenance Tool kit 	<ul style="list-style-type: none"> • Class Room/Workshop
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				<ul style="list-style-type: none"> • Air pressure Gauge • Pressure Gauges • Multimeter • Thermistor kit • Vacuum Gauge 	
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Module 8: Perform Advance Technical Drawings

Objective of the module: The aim of this module to get knowledge, skills and understanding to perform Advance Technical Drawings

Duration: 100 hours

Theory: 20 hours

Practical: 80 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Explore types of dimensioning and symbols	The trainee will be able to: <ol style="list-style-type: none"> 1. Draw different types of dimensions. 2. Draw different Architectural and Material symbols of technical drawing 	<ul style="list-style-type: none"> • Introduction of Technical Drawing • Types of dimensions. • Architectural symbols • Material symbols • Survey symbols 	Total: 26hrs Theory: 06hrs Practical: 20hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Erasers • Sharpeners • Pen • White board Marker 	<ul style="list-style-type: none"> • Class Room/Drawing Hall

	3. Draw different types of survey symbols (canal, trenches, tunnel, etc.)	Practical Activity: 1. Draw plan of 2 rooms mentioning dimensions and symbols for doors, windows, etc. 2. Draw survey and material symbols and label accordingly.		<ul style="list-style-type: none"> • Drawing Pencils • Clutch Pencil <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Drawing Board • Square set • Engineering Drawing Box 	
LU2: Develop Building Drawings	The trainee will be able to: 1. Draw different elements of building 2. Draw layout plan of building 3. Draw excavation/foundation	<ul style="list-style-type: none"> • Define Building drawings • Elements of building • Layout plan of building • Excavation/foundation plan • Elevation of building • Working drawings of building 	Total: 27hrs Theory: 07hrs Practical: 20hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Erasers • Sharpeners • Pen • White board Marker 	<ul style="list-style-type: none"> • Class Room/Drawing Hall

	plan 4. Draw elevation of building 5. Draw working drawing of building	Practical Activity: 1. Develop layout plan of a 5 Marla house. 2. Develop Submission drawing of a 5 Marla house. 3. Draw working drawing of ground floor plan of 5 Marla house.		<ul style="list-style-type: none"> • Drawing Pencils • Clutch Pencil Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Drawing Board • Square set • Engineering Drawing Box 	
LU3: Draw Sections	The trainee will be able to: 1. Draw sections of single storey building plan 2. Draw section of roads 3. Draw X-sections of different types of foundations	<ul style="list-style-type: none"> • Types of sections • Types of foundations • Types of roads, canals, trenches and tunnels. 	Total: 47hrs Theory: 07hrs Practical: 40hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Erasers • Sharpeners • Pen 	<ul style="list-style-type: none"> • Class Room • Drawing Hall

	<p>4. Draw sections of canals</p> <p>5. Draw sections of trenches</p> <p>6. Draw sections of tunnel</p>	<p>Practical Activity:</p> <p>1. Draw sections of single storey 5 Marla house plan.</p> <p>2. Draw cross section of any assigned trench.</p> <p>3. Draw cross section of assigned road (flexible/rigid).</p>		<ul style="list-style-type: none"> • White board • Marker • Drawing Pencils • Clutch Pencil <p>Non Consumable</p> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Drawing Board • Square set • Engineering Drawing Box 	
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General Assessment Guidance for *Digging Operation/ Technology*

Good practice in Pakistan makes use of sessional and final assessments, the basis of which is described below. Good practice by vocational training providers in Pakistan is to use a combination of these sessional and final assessments, combined to produce the final qualification result.

Sessional Assessment is going on all the time. Its purpose is to provide feedback on what students are learning:

- To the student: to identify achievement and areas for further work
- To the teacher: to evaluate the effectiveness of teaching to date, and to focus future plans.

Assessors need to devise sessional assessments for both theoretical and practical work. Guidance is provided in the assessment strategy

Final Assessment is the assessment, usually on completion of a course or module, which says whether or not the student has "passed". It is – or should be – undertaken with reference to all the objectives or outcomes of the course, and is usually fairly formal. Considerations of security – ensuring that the student who gets the credit is the person who did the work – assume considerable importance in final assessment.

Methods of Assessment

For lessons with a high quantity of theory, written or oral tests related to learning outcomes and/ or learning content can be conducted. For workplace lessons, assessment can focus on the quality of planning the related process, the quality of executing the process, the quality of the product and/or evaluation of the process.

Methods include direct assessment, which is the most desirable form of assessment. For this method, evidence is obtained by direct observation of the student's performance.

Examples for direct assessment of a Digging Operation Supervisor include:

- Work performances, for example perform basic communication, maintain personal health, hygiene and safety and perform basic computer operations
- Demonstrations, for example Identifying Electrical Circuits and Measurements
- Direct questioning, where the assessor would ask the student how to perform personal safety at work place, how they can communicate work place policy and procedures, how they can create electrical circuits and how they can measure these circuits

- Paper-based tests, such as multiple choice or short answer questions on communication at work place policy and procedures, Electrical Circuits and Measurements
- Indirect assessment is the method used where the performance could not be watched and evidence is gained indirectly.

Examples for indirect assessment of a Digging Operation Supervisor include:

- Work products, such as preparing and handling documents, perform some procedures of Milling
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Indirect assessment should only be a second choice. (In some cases, it may not even be guaranteed that the work products were produced by the person being assessed.)

Principles of Assessment

All assessments should be valid, reliable, fair and flexible:

Fairness means that there should be no advantages or disadvantages for any assessed person. For example, it should not happen that one student gets prior information about the type of work performance that will be assessed, while another candidate does not get any prior information.

Validity means that a valid assessment assesses what it claims to assess. For example, if documentation or identifying Electrical Circuits and Measurements are to be assessed and certificated, the assessment should involve performance criteria that are directly related to that documentation activity. An interview about the identifying Electrical Circuits and Measurements would not meet the performance criteria.

Reliability means that the assessment is consistent and reproducible. For example, if the work performance of preparing documents in words has been assessed, another assessor (e.g. the future employer) should be able to see the same work performance and witness the same level of achievement.

Flexibility means that the assessor has to be flexible concerning the assessment approach. For example, if there is a power failure during the assessment, the assessor should modify the arrangements to accommodate the students' needs.

Assessment strategy for *Digging Operation/ Technology*

This curriculum consists of 09 modules:

- **Module 1:** Identify and implement Workplace Policies and Procedures
- **Module 2:** Apply work health and safety practices (WHS)
- **Module 3:** Communicate at workplace
- **Module 4:** Perform Basic Computer operations
- **Module 5:** Perform Pre-digging tasks
- **Module 6:** Operate Digging Machine/Excavator
- **Module 7:** Perform Digging/Excavation Operation
- **Module 8:** Perform Maintenance of digging equipment
- **Module 9:** Perform Advance Technical Drawing

Sessional Assessment

The sessional assessment for all modules shall be in two parts: theoretical assessment and practical assessment. The sessional marks shall contribute to the final qualification.

Theoretical assessment for all learning modules must consist of a written paper lasting at least one hour per module. This can be a combination of multiple choice and short answer questions.

For practical assessment, all procedures and methods for the modules must be assessed on a sessional basis. Guidance is provided below under Planning for assessment.

Final Assessment

Final assessment shall be in two parts: theoretical assessment and practical assessment. The final assessment marks shall contribute to the final qualification.

The Assessment Team

The number of assessors must meet the needs of the students and the training provider. For example, where two assessors are conducting the assessment, there must be a maximum of five students per assessor. In this example, a group of 25 students shall therefore require assessments to be carried out over a four-day period. For a group of only 10 to 15 students, assessments would be carried out over a two-day period only.

Planning For Assessment

Sessional assessment: assessors need to plan in advance how they will conduct sessional assessments for each module. The tables on the following pages are for assessors to use to insert how many hours of theoretical and practical assessment will be conducted and what the scheduled dates are.

Final assessment: Training providers need to decide ways to combine modules into a cohesive two-day final assessment programme for each group of five students. Training providers must agree the content for practical assessments in advance.

Complete List of Tools and Equipment

Sr#	Description	Quantity
1.	Computer Systems	26
2.	Scanner	1
3.	Printer	1
4.	Hardness Testers	1
5.	Universal testing machine(UTM)	1
6.	Impact Testing Machines	1
7.	Steel Rulers	10
8.	Tri Square	10
9.	Inside Vernier Caliper	10
10.	Odd leg Vernier Caliper	10
11.	Trammel Vernier Caliper	10
12.	Outside Vernier Caliper	10
13.	Vernier Depth gauge	5
14.	Vernier Bevel protractor	5
15.	Thread gauges	5
16.	Screw pitch gauges	5
17.	Fillet gauges	5

18.	Feeler gauges	5
19.	Vernier Height gauge	5
20.	Dial indicators with magnetic stand	5
21.	Vernier Micrometer	5
22.	Inside Micrometer	5
23.	Outside Micrometer	10
24.	Depth Micrometer	5
25.	Snap Gauge set	2
26.	Dial Bore Gauge	5
27.	Set of Adjustable Wrench	5
28.	Set of Spanners (Open end, Ring)	5 each
29.	Pipe wrench	2
30.	L-key sets	5
31.	Nose pliers	5
32.	Grip pliers	5
33.	Crawler Excavator	5
34.	Wheel Excavator	5
35.	Wrenches	5
36.	Pliers	5
37.	Screw driver (Positive and negative)	5
38.	Hammer	5

39.	Vice grip	5
40.	Grease gun	5 each
41.	Paint brush	10
42.	Steel brush	25
43.	Crawler Excavator	10
44.	Measuring tape	10
45.	High pressure washer	5
46.	Air compressor	5
47.	Rigid and articulated dump truck (Off road)	5
48.	Dump truck (On road)	10 set
49.	Hopper	10
50.	Conveyor	10
51.	Vernier caliper (out, inside)	5
52.	Torque gauge	5
53.	Steel rule	5
54.	Multi-meter	5
55.	Thermometers	5
56.	Spanner set	10 packs
57.	Socket set	1
58.	ST(special service Tool)	1
59.	Drilling Machines	1

60.	Location Determining Devices	1
61.	Digging slant determining devices	1
62.	Communication Devices	10
63.	Sample Boxes	10
64.	Exploration and Scanning Devices	2
65.	Drawing board	25

List of Consumable Supplies

Sr no	Material	Quantity
1.	Note book	25
2.	Pencil	25
3.	White sheets	25
4.	Eraser	25
5.	Sharpener	25
6.	Pen	25
7.	Clutch pencils	25
8.	Sticky Notes	25
9.	Card sheets	100
10.	Cleaning brush	25
11.	Cotton rags	1KG

12.	PPE's	25
13.	Lubricants	In Litters
14.	Drawing Board	25
15.	Drawing Sheets	25 Books

Credit Values

The credit value of the National Certificate Level 2 in Digging Operation/Technology is defined by estimating the amount of time/ instruction hours required to complete each competency unit and competency standard. The NVQF uses a standard credit value of 1 credit = 10 hours of learning (Following Higher Education Commission (HEC) guidelines).

The credit values are as follows:

Competency Standard	Estimate of hours	Credit
A. Identify and implement Workplace Policies and Procedures	20	2
B. Apply work health and safety practices (WHS)	30	3
C. Communicate at workplace	30	3
D. Perform Basic Computer operations	50	5
E. Perform Pre-digging tasks	50	5
F. Operate Digging Machine/Excavator	110	11
G. Perform Digging/Excavation Operation	140	14
H. Perform Maintenance of digging equipment	70	7
I. Perform Advance Technical Drawing	100	10