



**T Level Technical Qualification in
Engineering and Manufacturing –
Maintenance, Installation and Repair**

8712-311 Mechanical

Grade standard exemplification material

Pass - summer 2024

Version and date	Change detail	Section	Question
v1-0 Oct 2024			

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Introduction

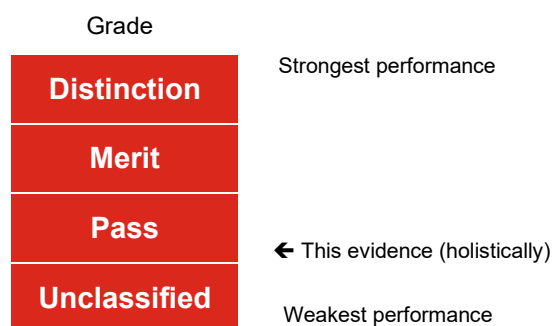
Summer 2024 Results

This document is aimed at providers and learners to help understand the standard that was required in the summer 2024 assessment series to achieve a pass grade for the 8712-311 Maintenance, Installation and Repair in Mechanical engineering Occupational Specialism (OS).

The grade standard exemplification evidence (Grade SEM) provided for the pass grade displays the holistic standard required across the tasks to achieve the pass grade boundary in the summer 2024 series.

The aim of these materials is to provide examples of knowledge, skills and understanding that attested to **three marks above** pass standard (threshold competence) in summer 2024. It is important to note that in live assessments a candidate's performance is very likely to exhibit a spikey profile and standard of performance will vary across tasks.

The Occupational Specialism is graded Distinction, Merit, Pass or Unclassified.



The pass grade boundary is based on a synoptic mark across all tasks. The materials in this Grade SEM are separated into two sections as described below. Materials are presented against a number of tasks from the assignment.

Tasks

This section details the tasks that the candidate has been asked to carry out. What needs to be submitted for marking and any additional evidence required including any photograph/video evidence. Candidate evidence that was or was not included in this Grade SEM has also been identified within this section.

In this Grade SEM there is candidate evidence from:

- Task 1 Plan and prepare
- Task 2 Perform and record
- Task 3A Review and report
- Task 3B Peer review
- Task 4 Complete handover

Candidate evidence

This section includes exemplars of candidate work, photographs of the work in production (or completed) and practical observation records of the assessment completed by provider assessors. This was evidence that was captured as part of the assessment and then internally marked by the provider assessor.

The Occupational Specialism brief and tasks can be downloaded from [here](#).

Important things to note:

- We discussed the approach to standard setting/maintaining with Ofqual and the other awarding organisations before awarding this year. We have agreed to take account of the newness of qualifications in how we award this year to recognise that students and teachers are less familiar with the assessments ([grading-arrangements-for-vtqsand-technical-qualifications-within-t-levels-in-the-academic-year-2023-to-2024](#)), whilst also recognising the standards required for these qualifications.
- The evidence presented, as a whole, was **three marks** above the pass grade. However, performance across the tasks may vary (i.e. some tasks completed to a higher/lower standard than pass grade).

Grade descriptors

To achieve a pass (threshold competence), a candidate will be able to:

Interpret technical information, plan, assess risk and follow safe working methods appropriately when applying practical skills to an acceptable standard to satisfy the requirements of the brief.

Adequately prepare working areas to allow safe working, acknowledging potential risks and applying acceptable housekeeping techniques during tasks.

Demonstrate basic technical skills for diagnosing components, assemblies and sub-assemblies to complete maintenance, installation and repair activities, in line with the requirements of the brief.

Demonstrate adequate skills using tools and equipment for mechanical maintenance, installation and repair, ensuring safe isolation, removal and replacement of components.

Demonstrate basic knowledge and understanding of the principles and processes required for disassembly, repair, configuration and re-assembly of mechanical systems, ensuring that most tolerances and tightening torques are in-line with specification.

Work safely showing an understanding and suitable level of awareness in the preparation and application of processes, selection and use of tools, equipment, materials and components for maintenance, installation and repair activities.

Mostly use industry and technical terminology accurately across different communication methods with some consideration of technical and non-technical audiences.

Task 1 Plan and prepare the service and maintenance activities

Assessment number (eg 1234-033)	8712-311
Assessment title	Mechanical Occupational Specialism

Candidate name	<first name> <surname>
City & Guilds candidate No.	ABC1234

Provider name	<provider name>
City & Guilds provider No.	999999a

Task(s)	1
Evidence title / description	List of requirements and resources Risk Assessment Method Statement
Date submitted by candidate	DD/MM/YY

Task 1

Assessment themes:

- Health and safety
- Planning and preparation
- Systems and components.

You must analyse the brief and technical information about the machine provided and then:

- create a list of the requirements and resources for the service and maintenance activities, justifying your selections. This should include:
 - all necessary technical information to confirm the type, scope and requirements of the activity
 - tools and equipment
 - materials, components and consumables
 - wastage and disposal requirements
 - time needed to carry out the activity
 - fault diagnosis methods to be used
 - any access requirements
- produce and complete a risk assessment
- produce a method statement.

Additional evidence of your performance that must be captured for marking:
none

Candidate evidence

Task 1 - Resources

Physical resources (tools/equipment)		
The following will be needed to undertake the maintenance activities.		
Resource	Quantity	Purpose & justification
Spanner set (ring, box, open) 8mm to 24mm	1	For nuts/ bolts fixings/ fastenings.
Socket set ¼ inch 8mm to 15mm	1	To use on the torque wrench or other appropriate components/fixings/fastenings.
Gripping tools (mole grips, pliers)	1	To hold items or help with removal.
Adjustable spanner	1	Undoing nuts, bolts and various fixing and fastenings.
Spare parts as required	1	If any fixings break these will require replacement to keep machinery in action.
Pen	1	Complete paperwork.
Imperial Allen key set	1	Remove any imperial allen key bolts
Materials and consumables		
The following will be needed to undertake the maintenance activities.		
Resource	Quantity	Purpose & justification
Rags and cleaning fluids As required	As required	Once the work is complete the floor and or surfaces require cleaning with a detergent or degreaser. Rags are helpful during the process to deal with small leaks or spillages.

Spill kit	1	In case of large spillages of fluid.
Oil (appropriate grade for task) 32 gearbox oil 68 lubrication	1	For lubricating moving parts as per the instruction manual.
Grease (lithium) threads and bearings	1	To lubricate all joints/moving parts as appropriate.
Protective equipment		
The following PPE are required to support safety during the maintenance activities, and to meet requirements of the Health and Safety at Work Act (HASAWA).		
Resource	Quantity	Purpose & justification
Gloves (disposable)	1	To reduce chances of injury/contamination to hands, also to provide extra grip. Worn throughout the whole process.
Goggles/ glasses	1	To use when using spray lubricants and at other times when there may be a risk of eye injury present. Used to prevent ingress or eye damage.
Warning signs and notices	As required	To indicate that air and electrical supplies are isolated, informing others in the work area.

Technical Information	
The following technical information and documentation will be required to refer to during the maintenance activities to support accurate application of equipment, and to ensure the brief requirements are met.	
Requirement	Purpose and justification
Manuals for the lathe machine	To ensure all information is on hand for reference. Instructions and frequently asked questions for use, maintenance, disassembly, repair and installation of the complete system and individual sub-assemblies.
MSDS for lubricants	To provide preventative and other COSHH related information when lubricating the joints etc.
Method statement	To refer to during maintenance activities to ensure logical order can be easily followed.
Fault finding/diagnostic techniques and methods	
Sensory checks	Using my senses to detect noise, vibration or unusual sounds/scents. Visually inspect the system to identify any obvious issues, such as a fault being displayed on the digital readout, loose wiring etc. Smell to ensure there is no burning of wires or components. Listen to the system for any unusual noises that may indicate an issue such as a buzzing or rattling. Touching the system could indicate whether the machine is within expected operational temperatures and feel for any vibration.
Half split technique	Check hydraulic systems and operations, electric system and operations. Splitting the fault location down to a specific location (half split).

Task 1 – Risk Assessment

3. Hazards	4. Nature of risks	5. Existing control measures	6. Risk calculation			
			A Severity	B Probability	C Risk rating (=A x B)	Action priority
Slipping	Oil or Coolant may be released by the removal of certain components	Oil resistant boots, spill kits	2	4	8	5
Impaling	Any broken components which may be sticking out the machine	Tough coveralls and awareness	4	2	8	5
Crushing	When removing parts which can be acting as a placeholder for heavy components dropping on your person(s)	Knowledge and self awareness	4	2	8	4
Moving parts	Parts of the lathe have been designed to be freely moveable	Knowledge and awareness of the risk	4	2	8	5
Collapsing	Parts may fall or collapse if left unsecure	Knowledge and correct equipment	2	4	8	3
Over Turning	Heavy parts of the machine may roll	Making sure nothing is in a position that can cause falling	4	1	4	2
Noise	Hearing may be affected with loud noises	Ear protection should be worn when needed	4			

1. Operations covered by this assessment
2. Details of any person(s) specifically at risk

7. Activities identified as requiring more specific assessments:

NOTES: Calculation of risk rating factor

Severity is based on there being no control measures in place.

Probability is calculated on basis of existing control measures in place.

A: Severity of incident		B: Probability of occurrence		Determining action priority
Insignificant	1	Very unlikely	1	1 – 10 Low priority (Action if reasonably practicable; otherwise, acceptable)
Minor	2	Unlikely	2	11 – 15 Medium priority (Must take action)
Significant	3	Possible	3	16 – 25 High priority (Must take action)
Major	4	Likely	4	
Fatality	5	Very likely	5	

8. FURTHER CONTROL MEASURES TO BE ACTIONED (if applicable)

(Timescale to take account of action priority)

a. Further control measures to be actioned	b. Action by	c. Target date	d. Further control measures checked	e. Risk rating (A x B = C)
Information and training needs				

Task 1 – Method Statement

Method statement

1. Maintenance- Initial pre-maintenance checks

The requirement for the maintenance task will require the following PPE:

1. Gloves
2. Safety glasses
3. Boots steel toe
4. Overalls
5. Nitrile gloves

All PPE is to be thoroughly checked to ensure that there is no damage and that it is fit for purpose. Should the PPE not be fit for purpose or found to be damaged, this will be reported to the appropriate people. Once checked and fully wearing the required and appropriate PPE the working area can be entered.

Once the work area has been entered, I will visually check the area initially to ensure the area is clean, safe and tidy. I will remove any objects, equipment or tools that may be on the floor to mitigate the chance of slips, trips and falls, then put signage in place indicating work is being carried out.

Once I have completed all these checks I will be fully capable and fit with both the PPE regulations (Personal Protective Equipment at work Regulations 1992) and the HASAWA (Health and Safety at Work Act 1974).

2. Undertaking the maintenance activity *(Vibration of the spindle)*

The first thing I will do is visually inspect the lathe machine and function check the lathe machine to ensure that it is in an operational condition and a healthy state. I will start by running the machine to see in what 'state' it currently runs in.

It has been indicated to me that there is a fault on the spindle.

Therefore I will be conducting fault finding processes, using more than one style to locate, identify and diagnose the issues with success.

If any faults should arise, I will apply the appropriate fault-finding techniques to investigate and diagnose any potential causes. For example, if the longitudinal travel is stiff, then I will refer to the manual for guidance if necessary. I will then investigate to find the fault(s) and prove the item or component found to be faulty is confirmed as being faulty before replacing or repairing.

I will begin any testing that may be required, remove and replace any equipment and components that may be faulty. Once all the faults have been resolved, I will start to begin with the maintenance activity. If diagnosis is not appropriate, then I will proceed to follow the maintenance schedule as listed in the manual and record my findings and diagnose as I go.

Once I am happy with this, I will switch off the supply. I will lock off the supply to ensure it cannot be re-energised whilst I am working on it. I will proceed to clean down the lathe machine as part of maintenance to prevent any debris from getting inside the milling machine when the sub-assemblies/covers are removed.

Once I am happy the lathe machine is cleaned, I will remove any sub-assemblies to gain access to the components as appropriate. I will visually inspect the components and wiring of the lathe machine to ensure all connections are electrically sound and that no damage or wear and tears are visible.

I will also check all gears and surfaces for wear, tear and lubrication, lubricating with the appropriate grease or oil (as per the specification). I will check the entire lathe machine, assemblies and subassemblies for security and tightness, if any fastenings/fixing are showing signs of wear and tear then these will be replaced as appropriate.

During this maintenance I will need to check the running of and replace the lubricating cutting fluid. To do this I need to drain the lubricating cutting fluid from the reservoir and gain the appropriate access to catch the fluid. I will clean the reservoir tank and refill the cutting fluid, checking the PH with the dip sticks and refractometer. Once this has been done and safely stored, I can proceed to remove, inspect for filings and replace the gearbox oil.

The reason for checking for filings is to indicate excessive wear on the gears. Then this will need to be assembled and tightened in accordance with the manual. I will dismantle the X and Y axis worm gears housing and check the tolerance values for backlash adjusting the lead screws to correct tolerance values. I will proceed to check the bed is true and level using a spirit level, feeler gauges and an engineer's square.

Once I am happy, I will reassemble the milling machine in the correct order, torquing up the main fixings to the appropriate torque. The sub-assemblies are mainly nuts and bolts and these will be tightened as per the manufacturer's specification.

Another very important process to be followed is to ensure all greased components are cleaned off and re-greased. The same applies to the oiled surfaces. It is important to clean and reapply the oil and grease as it likely contains debris and carbon deposits from general use of the machine. As it is high temperature grease, it can become hard/waxy over time, which could cause seizing of important components if not refreshed. I will then re-energise the lathe machine and complete a function check to ensure the lathe machine is operating correctly.

3. Post-maintenance

Once I am satisfied that the maintenance has been completed, I will tidy up my work area and ensure that all tools and equipment are free from damage before returning to dedicated storage. I will clean my area and dispose of waste correctly, ensuring any disposal and regulatory requirements are followed.

I will then handover the milling machine to the assessor, demonstrating the milling machine functionality and condition as part of the handover agreement. I will complete any necessary paperwork and amend any documentation that may need amending, before handing this over to the supervisor

Task 2 Perform and record the service and maintenance activities

Assessment number (eg 1234-033)	8712-311
Assessment title	Mechanical Occupational Specialism

Candidate name	<first name> <surname>
City & Guilds candidate No.	ABC1234

Provider name	<provider name>
City & Guilds provider No.	999999a

Task(s)	2
Evidence title / description	Test Record Sheets Maintenance Records and Control Documents Annotated Method Statement Assessor Observation (Practical Observation Form) Photographic Evidence
Date submitted by candidate	DD/MM/YY

Task 2

Assessment themes:

- Health and safety
- Planning and preparation
- Systems and components
- Working with faults
- Reviewing and reporting

You must:

- prepare the work area for the maintenance and servicing activities
- perform the annual service and maintenance activities in accordance with the method statement and planning documents produced in Task 1. This should include:
 - decommissioning and inspection of the machine
 - disassembly and reassembly of the machine
 - diagnosing and recording faults within the machine, including carrying out appropriate tests
 - repairing the faults and replacing components and consumables as required
 - safely using the appropriate tools and equipment
 - recommissioning of the machine
 - re-instating the work area
- record the service and maintenance activities, to include:
 - producing and completing test record sheets
 - updating the maintenance record and control documents
 - annotating the method statement, including any recommendations for further investigation if required.

Additional evidence of your performance that must be captured for marking:

none

Candidate evidence

Task 2 – Test Record Sheets

Test Record Sheet (Centre Lathe)			
Name of equipment:	Lathe		
Manufacturer:			
Date completed:			
Name:			
Steps	Check ed	Repaired/ method used to repair	Comments
Drain gearbox oil	TRUE	Drained, cleaned and replenished.	Fill gear box up with 32 gear box oil
check pipes for any debris	TRUE	Ran lathe and checked pipes	Pipes in good condition all fluid flows freely, no blockages.
Check oil level and colouration	TRUE	No excessive metal filings present, oil	Hyd oil EP220 used.

		clearly used and dirty. Filled until level	
		gauge indicated the correct level.	
Re-alignment of chuck	TRUE	Removed chuck and teeth re-aligned the teeth	replaced one chuck teeth
Re-alignment of tailstock	TRUE	remove tailstock give wipe down take out two allen key screws tighten until re-aligned	
Removed gear train	TRUE	Gear train removed held in with 2 19mm nuts and 1 14mm bolt	drive gear chipped
Removed locking nut at end of bearing	TRUE	Centre punch and ball pane hammer ta round	damage to locking nut due to centre punch
Remove end block for Lead screw	TRUE	2 6mm bolts from end block use pry bar and hammer to knock off pull out lead screw	1 locating roll pin missing

Task 2b - Maintenance Records and Control Documents

Equipment Maintenance Log					
Name of equipment:	Lathe				

Name:					
Manufacturer:					
Date:					

Date:	Maintenance description:	Maintenance performed by:	Actions taken:	Next maintenance planned on:	Remarks:
30/04/2024	Re- alignment of spindle and tailstock.		Alignmet correct, low level maintainence applied	30/05/2024	Order lithium grease
30/04/2024	Strip down of lead screw regreased		End block removed screw out and cleaned	30/05/2024	Order lithium grease
30/04/2024	Replace oil		Side cover off remove oil plug and add 5L 32 grade oil	30/05/2024	
30/04/2024	Chuck Alinement		Chuck removed and teeth removed 1 replacement	30/05/2024	
30/04/2024	de-grease lathe		Grease removed off lathe	30/05/2024	
30/04/2024	de-oil Lathe		Oil removed off lathe	30/05/2024	

Task 2 Annotated Method Statement

Method statement

1. Maintenance- Initial pre-maintenance checks

The requirement for the maintenance task will require the following PPE:

1. Gloves
2. Safety glasses
3. Boots steel toe
4. Overalls
5. Nitrile gloves

All PPE is to be thoroughly checked to ensure that there is no damage and that it is fit for purpose. Should the PPE not be fit for purpose or found to be damaged, this will be reported to the appropriate people. Once checked and fully wearing the required and appropriate PPE the working area can be entered.

Once the work area has been entered, I will visually check the area initially to ensure the area is clean, safe and tidy. I will remove any objects, equipment or tools that may be on the floor to mitigate the chance of slips, trips and falls, then put signage in place indicating work is being carried out.

Once I have completed all these checks I will be fully capable and fit with both the PPE regulations (Personal Protective Equipment at Work Regulations 1992) and the HASAWA (Health and Safety at Work Act 1974).

2. Undertaking the maintenance activity *(Vibration of the spindle)*

The first thing I will do is visually inspect the lathe machine and function check the lathe machine to ensure that it is in an operational condition and a healthy state. I will start by running the machine to see in what 'state' it currently runs in.

It has been indicated to me that there is a fault on the spindle. Therefore I will be conducting fault finding processes, using more than one style to locate, identify and diagnose the issues with success.

If any faults should arise, I will apply the appropriate fault-finding techniques to investigate and diagnose any potential causes. For example, if the longitudinal travel is stiff, then I will refer to the manual for guidance if necessary. I will then investigate to find the fault(s) and prove the item or component found to be faulty is confirmed as being faulty before replacing or repairing.

I will begin any testing that may be required, remove and replace any equipment and components that may be faulty. Once all the faults have been resolved, I will start to begin with the maintenance activity. If diagnosis is not appropriate, then I will proceed to follow the maintenance schedule as listed in the manual and record my findings and diagnose as I go.

Once I am happy with this, I will switch off the supply. I will lock off the supply to ensure it cannot be re-energised whilst I am working on it. I will proceed to clean down the lathe machine as part of maintenance to prevent any debris from getting inside the milling machine when the sub-assemblies/covers are removed.

Once I am happy the lathe machine is cleaned, I will remove any sub-assemblies to gain access to the components as appropriate. I will visually inspect the components and wiring of the lathe machine to ensure all connections are electrically sound and that no damage or wear and tears are visible.

I will also check all gears and surfaces for wear, tear and lubrication (**middle drive gear lost teeth**), lubricating with the appropriate grease or oil (as per the specification). I will check the entire lathe machine, assemblies and subassemblies for security and tightness, if any fastenings/fixing are showing signs of wear and tear then these will be replaced as appropriate.

During this maintenance I will need to check the running of and replace the lubricating cutting fluid. To do this I need to drain the lubricating cutting fluid from the reservoir and gain the appropriate access to catch the fluid. I will clean the reservoir tank and refill the cutting fluid, checking the PH with the dip sticks and refractometer. Once this has been done and safely stored, I can proceed to remove, inspect for filings and replace the gearbox oil.

The reason for checking for filings is to indicate excessive wear on the gears. Then this will need to be assembled and tightened in accordance with the manual. I will dismantle the X and Y axis worm gears housing and check the tolerance values for backlash adjusting the lead screws to correct tolerance values. I will proceed to check the bed is true and level using a spirit level, feeler gauges and an engineer's square.

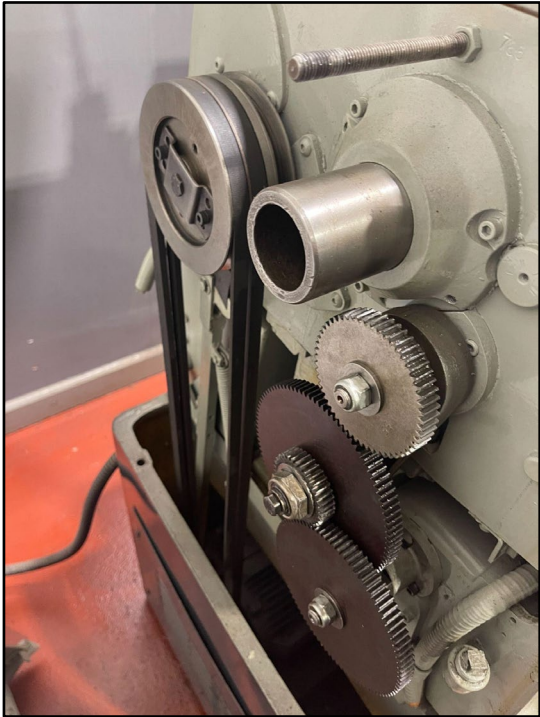
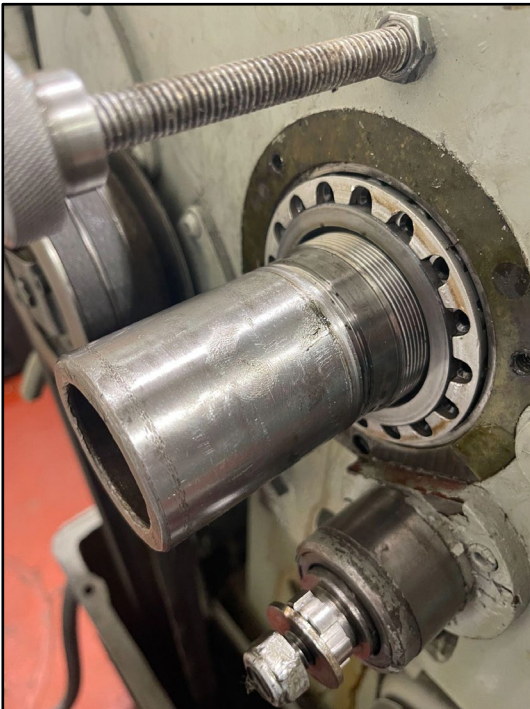
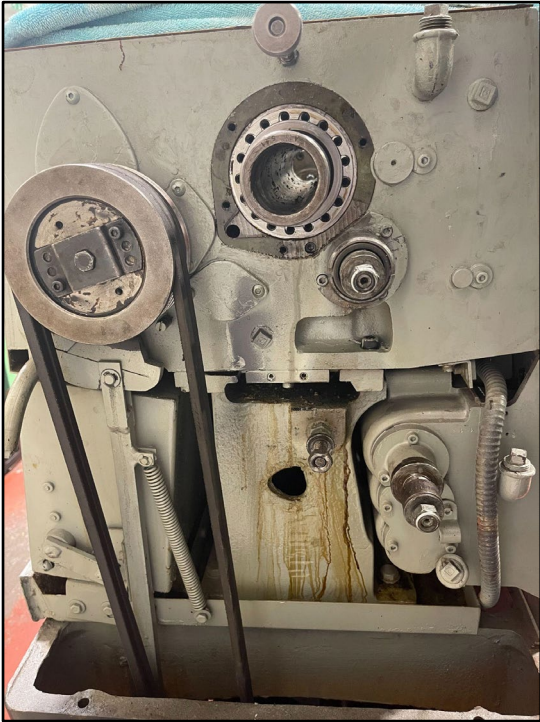
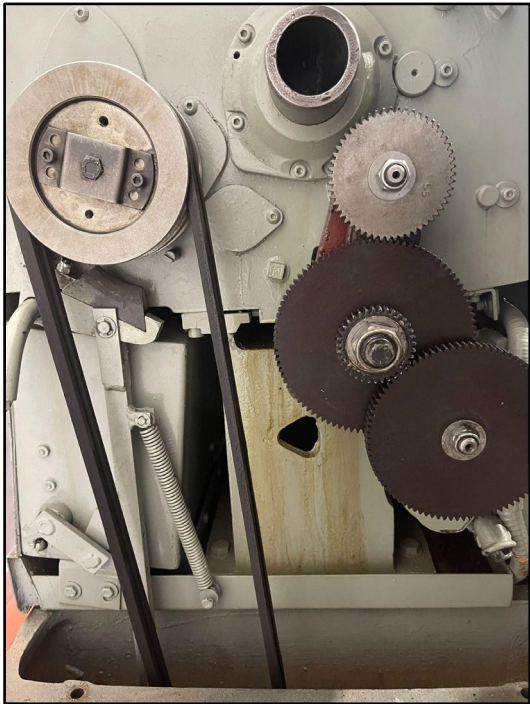
Once I am happy, I will reassemble the lathe in the correct order, torquing up the main fixings to the appropriate torque (80nm). The sub-assemblies are mainly nuts and bolts and these will be tightened as per the manufacturer's specification.

Another very important process to be followed is to ensure all greased components are cleaned off and re-greased. The same applies to the oiled surfaces. It is important to clean and reapply the oil and grease as it likely contains debris and carbon deposits from general use of the machine. As it is high temperature grease, it can become hard/waxy over time, which could cause seizing of important components if not refreshed. I will then re-energise the lathe machine and complete a function check to ensure the lathe machine is operating correctly.

3. Post-maintenance

Once I am satisfied that the maintenance has been completed, I will tidy up my work area and ensure that all tools and equipment are free from damage before returning to dedicated storage. I will clean my area and dispose of waste correctly, ensuring any disposal and regulatory requirements are followed.

I will then handover the milling machine to the assessor, demonstrating the milling machine functionality and condition as part of the handover agreement. I will complete any necessary paperwork and amend any documentation that may need amending, before handing this over to the supervisor.



Possible faults whilst working on the lathe.

Vibration through spindle.

1. Damaged bearing (debris, discoloration, damaged, brinelling)
2. Drive belt loose- serviceability of belt
3. Misaligned chuck- check concentricity, damaged teeth in chuck
4. Misaligned tailstock- check left and right axis, swarf in guide rails
5. Jib incorrectly fitted, too loose, too tight

No power (ensure the machine is de-energised!)

1. Check guard microswitch
2. Check electric box at rear
3. Check motor

Leaking/ loss of fluid

1. Check hoses/ pipes to source
2. Check tightness of sump
3. Check for blockages
4. Check oil sight level

Task 2 – Assessor Observation - Practical Observation Form

8712-311 Maintenance Engineering Technologies: Mechanical - summer 2024

Candidate Name	Candidate number
Provider name	Date

Complete the table below referring to the relevant marking grid, found in the assessment pack.

Do not allocate marks at this stage.

This observation must cover	Assessor observation should include:	Assessment Themes
Work area preparation	<ul style="list-style-type: none"> The work area preparation. 	<ul style="list-style-type: none"> Health and Safety Planning and Preparation Systems and Components
Service and maintenance activities	<ul style="list-style-type: none"> decommissioning and inspection of the system disassembly and reassembly of the system diagnosis and recording of faults within the system, including carrying out appropriate tests repairing the faults and replacing components and consumables use of tools and equipment recommissioning of the system re-instating the work area. 	<ul style="list-style-type: none"> Health and Safety Planning and Preparation Systems and Components

Notes – detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.

Work area preparation:

Candidate collected all tools and COSHH items before beginning the task and ensured he was wearing all of the correct PPE to enable him to work safely. He checked all of the required documentation was in date and appropriate for the work he was about to carry out before starting the task.

Service and maintenance activities:

- **decommissioning and inspection of the system**

Lock off-Tag off procedures were followed throughout the maintenance activity. All parts were removed and cleaned before being inspected, re-lubricated and refitted

- **disassembly and reassembly of the system**

Candidate showed decent hand skills during the disassembly process of the lathe for servicing and inspection. He did struggle with the refit of the leadscrew, but persevered and managed to complete this task in the allotted time.

- **diagnosis and recording of faults within the system, including carrying out appropriate tests**

Candidate displayed good fault finding skills throughout, although the initial electrical fault turned out to be 2 separate issues and he only found one initially, put the system back together only to find it still didn't operate. He had to disassemble the electrical panel again to find the second fault, a little more thorough inspection the first time around could have saved him some time here. The vibration fault was tested before and after rectification using a DTI gauge which clearly showed he had removed the fault.

- **repairing the faults and replacing components and consumables**

All faults were found and repaired in the allotted time, although Candidate did waste some time re-assembling things only to discover he had not found all of the faults (electrical panel). Working a little more thoroughly would have saved him some time. The consumables used in the maintenance task were appropriate and disposed of in the correct manner.

- **use of tools and equipment**

Candidate displayed decent hand skills throughout the task, using the correct tooling through the whole process.

- **recommissioning of the system**

The system was inspected and re assembled correctly. He did a test run of the lathe to ensure correct operation and also turned down a test piece to show that it was operational.

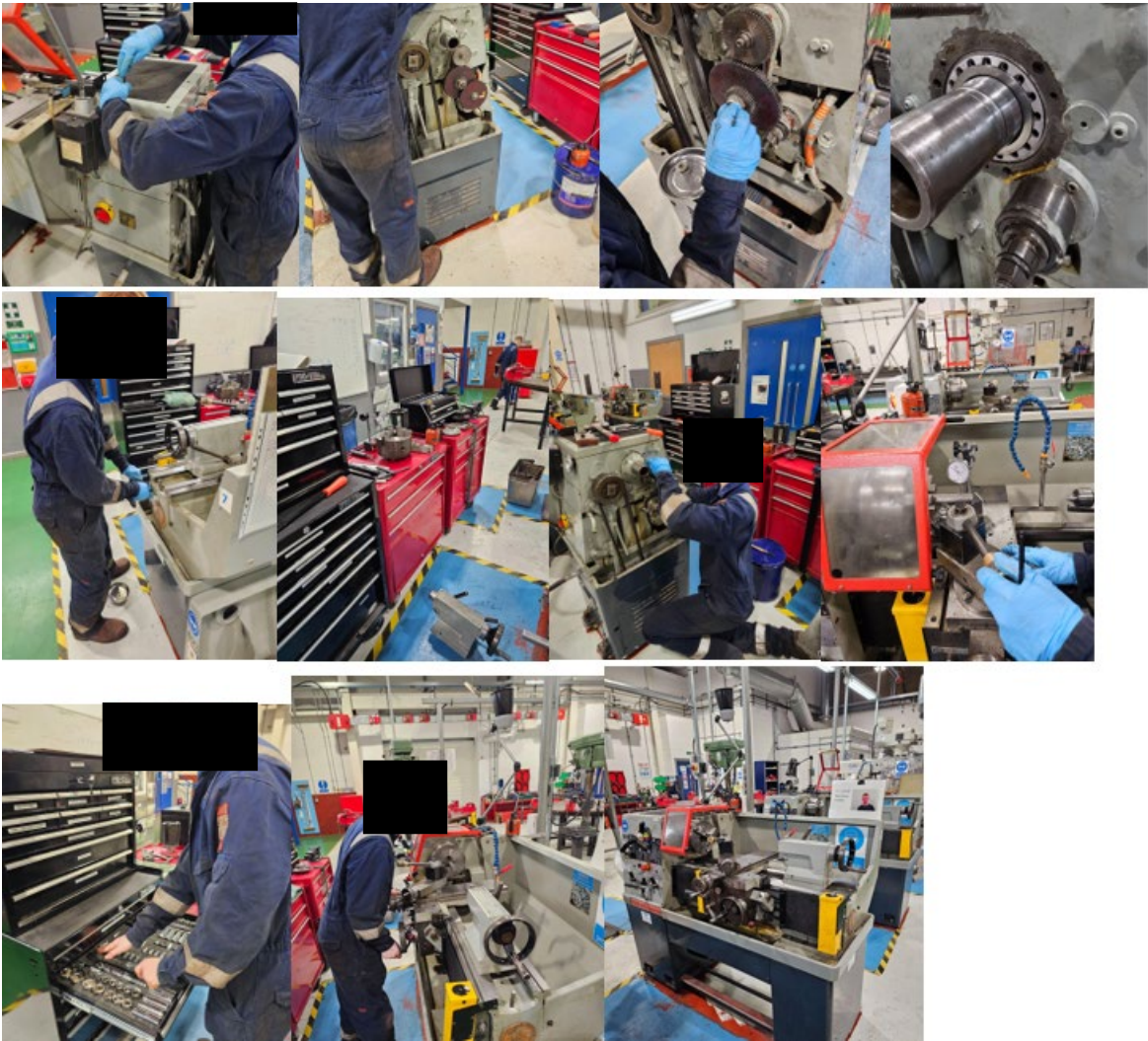
- **reinstating the work area.**

Candidate cleaned down all the tooling and returned them to the correct areas of the toolbox, placed all of the COSHH items back in the locker. During the course of the maintenance activity there was a slight oil spill which Candidate responded to immediately using the spill

kit. He ensured this was all cleaned away at the end of the task to leave a safe working environment.

Internal assessor signature	Date
XXX	XXX

Task 2 - Photographic Evidence





From top left

1. Top cover removal to expose gears
2. As above
3. Gear train removal
4. Bearings exposed for inspection
5. Start of lead screw removal
6. Parts laid out for inspection
7. Gear train refit
8. Using DTI gauge to check for vibration fault rectification
9. Initial tool check at start
10. Turning down a test piece to show correct operation

11. Lathe before maintenance task
12. Work area checks before maintenance commences
13. COSHH SDS checks prior to work starting
14. As above
15. Lock off Tag off procedure
16. Electric panel removal to fault find
17. Loose wire located behind electrical panel
18. Second loose wire being reconnected

Task 3A Review and report the maintenance activities

Assessment number (eg 1234-033)	8712-311
Assessment title	Mechanical Occupational specialism

Candidate name	<first name> <surname>
City & Guilds candidate No.	ABC1234

Provider name	<provider name>
City & Guilds provider No.	999999a

Task(s)	3A
Evidence title / description	Technical report
Date submitted by candidate	DD/MM/YY

Task 3A

Assessment themes:

- Health and safety
- Systems and components
- Reviewing and reporting

You must:

- produce a technical report for the supervisor. This should typically be 850 words and include:
 - a review of the maintenance activities, including fault diagnosis/detection techniques and suggestions for future improvements
 - the faults found and how they were rectified
 - any outstanding faults, including recommendations that may require attention before the next planned maintenance activity according to the current maintenance schedule
 - reporting of stock levels and waste disposal.
- produce a revised maintenance schedule from your activities and findings, this should include:
 - recommendations for future planned maintenance, including justifications
 - due date of next maintenance activity.

Additional evidence of your performance that must be captured for marking:

none

Candidate evidence

Task 3a – Technical Report

1. Maintenance- Initial pre-maintenance checks

The requirement for the maintenance task will require the following PPE:

1. Gloves
2. Light Safety glasses
3. Boots steel toe
4. Oil resistant coveralls

All PPE is to be thoroughly checked to ensure that there is no damage and that it is fit for purpose. Should the PPE not be fit for purpose or found to be damaged, this will be reported to the appropriate people. Once checked and fully wearing the required and appropriate PPE the working area can be entered.

Once the work area has been entered, I will visually check the area initially to ensure the area is clean, safe and tidy. I will remove any objects, equipment or tools that may be on the floor to mitigate the chance of slips, trips and falls, then put signage in place indicating work is being carried out.

All of the above will be in compliance with both the PPE regulations (Personal Protective Equipment at work Regulations 1992) and the HASAWA (Health and Safety at Work Act 1974).

2. Undertaking the maintenance activity

The first thing I will do is visually inspect the lathe machine and function check the lathe machine to ensure that it is in an operational condition and a healthy state. I will start by running the machine to see in what 'state' it currently runs in.

It has been indicated to me that there is an intermittent fault inside the Spindle which is affecting the functionality of the machine therefore I will be conducting fault finding processes, using more than one style to locate, identify and diagnose the issues with success.

If any faults should arise, I will apply the appropriate fault-finding techniques to investigate and diagnose any potential causes. For example, if the X axis travel is stiff, then I will refer to the manual for guidance if necessary. I will then investigate to find the fault(s) and prove the item or component found to be faulty is confirmed as being faulty before replacing or

repairing.

I conducted the testing that may be required, remove and replace any equipment and components that may be faulty. Once all the faults have been rectified, I will commence with the maintenance activity. If diagnosis is not appropriate, then I will proceed to follow the maintenance schedule as listed in the manual and record my findings and diagnose as I go.

Once I was satisfied, I switched off the supply. I will lock off the supply to ensure it cannot be re-energised whilst I was working on it. I proceeded to clean down the lathe machine as part of maintenance to prevent any debris from getting inside the milling machine when the sub-assemblies/covers are removed.

Once I was happy the lathe machine is cleaned, I will remove any sub-assemblies to gain access to the components as appropriate. I will visually inspect the components and wiring of the lathe machine to ensure all connections are electrically sound and that no damage or wear and tears are visible.

The Apron gearbox is held under the cross slide, it controls the movement of the Tool Holder which holds the cutting tool and moves it in the x axis. The apron gearbox also has controls like automatic feed and different speeds via different gear ratios.

It is also expected that the apron gearbox will be heavy so it may be necessary to seek the help of a fellow Engineer to hold the gearbox while the bolts are removed from the top. The lead screw will also have to be removed. The lead screw transmits power from the headstock to the carriage for screw thread cutting operations. The feed rod will also have to be removed. The feed rod transmits power from the headstock to the carriage for feeding operations.

I will also check all gears and surfaces for wear, tear and lubrication, lubricating with the appropriate grease or oil (as per the specification). I will check the entire lathe machine, assemblies and subassemblies for security and tightness, if any fastenings/fixing are showing signs of wear and tear then these will be replaced as appropriate.

During this maintenance I will need to check the running of and replace the lubricating cutting fluid. To do this I need to drain the lubricating cutting fluid from the reservoir and gain the appropriate access to catch the fluid. I will clean the reservoir tank and refill the cutting fluid, checking the PH with the dip sticks and refractometer. Once this has been done and safely stored, I can proceed to remove, inspect for filings and replace the gearbox oil.

The reason for checking for filings is to indicate excessive wear on the gears. Then this will need to be assembled and tightened in accordance with the manual. I will dismantle the X

and Y axis worm gears housing and check the tolerance values for backlash adjusting the lead screws to correct tolerance values. I will proceed to check the bed is true and level using a spirit level, feeler gauges and an engineer's square.

Once I was happy, I reassembled the lathe machine in the correct order, torquing up the main fixings to the appropriate torque. The sub-assemblies are mainly nuts and bolts and these will be tightened as per the manufacturer's specification.

Another very important process I followed is to ensure all greased components are cleaned off and re-greased. The same applies to the oiled surfaces. It is important to clean and reapply the oil and grease as it likely contains debris and carbon deposits from general use of the machine. As it is high temperature grease, it can become hard/waxy over time, which could cause seizing of important components if not refreshed. I will then re-energise the lathe machine and complete a function check to ensure the lathe machine is operating correctly.

3. Post-maintenance

Once I was satisfied that the maintenance has been completed, I will tidy up my work area and ensure that all tools and equipment are free from damage before returning to dedicated storage. I will clean my area and dispose of waste correctly, ensuring any disposal and regulatory requirements are followed.

I then handed over the lathe machine to the assessor, demonstrating the milling machine functionality and condition as part of the handover agreement. I will complete any necessary paperwork and amend any documentation that may need amending, before handing this over to the supervisor

4. Maintenance schedule components

Hydraulics

<u>Maintenance Item</u>	<u>Interval</u>
Clean chips from the coolant collector	Weekly
Inspect the oil level	Monthly
Change the Hydraulic fluid conditions	Every 2 years or as needed per
Replace the oil filter	Annually

Chuck

<u>Maintenance Item</u>	<u>Interval</u>
Grease the chuck jaws	Weekly
Chuck Multi-Point Inspection	6 Months
Clean the Chuck	Annually

Spindle Lubrication

<u>Maintenance Item</u>	<u>Interval</u>
Inspect lubrication tank level	Monthly
Perform Spindle Lubrication Test	6 Months

Gearbox main/ Apron

<u>Maintenance Item</u>	<u>Interval</u>
Inspect the oil level	Monthly
Replace the oil	Annually

Gear condition Annually

Coolant System

<u>Maintenance Item</u>	<u>Interval</u>
Clean the filter screen	As Required
Inspect the coolant level	Weekly
Inspect the coolant concentration	Weekly
Completely clean the coolant tank and replace the coolant	6 Months
Verify coolant refill is operating correctly	6 Months
Inspect coolant lines for chips	Monthly

Tailstock

Belts

Task 3B Peer Review

Assessment number (eg 1234-033)	8712-311
Assessment title	Mechanical Occupational specialism

Candidate name	<first name> <surname>
City & Guilds candidate No.	ABC1234

Provider name	<provider name>
City & Guilds provider No.	999999a

Task(s)	3B
Evidence title / description	Revised Maintenance Schedule Peer Review Form Amended Method Statement
Date submitted by candidate	DD/MM/YY

Task 3B

Assessment themes:

- Reviewing and reporting

You must:

- carry out a peer review on two annotated method statements provided by the assessor. You must consider the following:
 - *how well does the method statement enable maintenance activities to be performed and recorded?*
 - *how appropriate is the method statement and why?*
 - *what are the implications to the business of the proposed method statement?*
 - *how could the method statement be optimised/ improved?*
- write up feedback for each of the annotated method statements produced by other candidates on separate peer review forms.
- update your own annotated method statement following feedback from the peer review. Any updates need to include justifications for these changes and any changes not made will be reviewed in the handover.

Additional evidence of your performance that must be captured for marking:

none

Candidate evidence

Task 3b - Revised Maintenance Schedule

Maintenance Schedule (Lathe)				
Name of equipment:	Lathe			
Manufacturer:				
Name:				
Date:				
Date:	Time:	Item:	Checked/ Completed by:	Remarks:
30/04/2024	09:00	Check coolant level		Topped up to correct level
30/04/2024	09:05	Check Leadscrew		Cleaned and re-greased- Lithium
30/04/2024	09:30	Check spindle and tailstock alignment		Adjusted tailstock parallelism to spindle
30/04/2024	10:00	Inspect carrier gearbox		Oil level low and condition fine

30/04/2024	13:30	Check spindle and tailstock alignment		Adjusted spindle parallelism to tailstock
30/04/2024	13:45	Gearbox oil change		Oil changed and level correct Hyd 32
30/04/2024	14:00	Grease leadscrew		Cleaned and re-greased-Lithium
30/04/2024	14:15	Generic clean and lubrication of sub components		Cleaned, lubrication applied Hyd 68

Task 3b - Peer Review Forms

Assessment ID	Qualification number
3b	
Candidate name	Candidate number
Provider name	Provider number
Date	Series
02/05/2024	Summer 2024

Question	Feedback
How well does the method statement enable the maintenance activities to be performed and recorded?	This method statement is well made and worded. It is very easy to understand and the layout isn't blocked up.
How appropriate is the method statement and why?	The method statement is perfectly written out specifically for this task
What are the implications to the business of the proposed method statement?	More professional terminology needed
How could the method statement be optimised/ improved?	Better terminology and shorten some sentences, some sentences have been dragged out too long making some parts of the method statement awkward to read.

Peer Review Form

Assessment ID	Qualification number
3b	
Candidate name	Candidate number
Provider name	Provider number
Date	Series
02/05/2024	

Question	Feedback
How well does the method statement enable the maintenance activities to be performed and recorded?	The method statement was well detailed and easy to follow with simple instructions which was laid out in a effective manor
How appropriate is the method statement and why?	the method statement is appropriate for the task at hand with a few alterations needed to make this method statement applicable to any engineer.
What are the implications to the business of the proposed method statement?	This method statement would not be adequate in a real world work environment. Due to it's layout it makes it harder to pick out important sections and instructions, you have to do it thoroughly and try and pick out what you actually have to do.
How could the method statement be optimised/ improved?	Adjust the layout into less blocky format and into a more flow-like state so it' easier on the reader.

Method statement

1. Maintenance- Initial pre-maintenance checks

The requirement for the maintenance task will require the following PPE:

1. Gloves
2. Safety glasses
3. Boots steel toe
4. Overalls
5. Nitrile gloves

All PPE is to be thoroughly checked to ensure that there is no damage and that it is fit for purpose. Should the PPE not be fit for purpose or found to be damaged, this will be reported to the appropriate people. Once checked and fully wearing the required and appropriate PPE the working area can be entered.

Once the work area has been entered, I will visually check the area initially to ensure the area is clean, safe and tidy. I will remove any objects, equipment or tools that may be on the floor to mitigate the chance of slips, trips and falls, then put signage in place indicating work is being carried out.

Once I have completed all these checks I will be fully capable and fit with both the PPE regulations (Personal Protective Equipment at work Regulations 1992) and the HASAWA (Health and Safety at Work Act 1974).

2. Undertaking the maintenance activity (*Vibration of the spindle*)

The first thing I will do is visually inspect the lathe machine and function check the lathe machine to ensure that it is in an operational condition and a healthy state. I will start by running the machine to see in what 'state' it currently runs in.

It has been indicated to me that there is a fault on the spindle. Therefore I will be conducting fault finding processes, using more than one style to locate, identify and diagnose the issues with success.

If any faults should arise, I will apply the appropriate fault-finding techniques to investigate and diagnose any potential causes. For example, if the longitudinal travel is stiff, then I will refer to the manual for guidance if necessary. I will then investigate to find the fault(s) and

prove the item or component found to be faulty is confirmed as being faulty before replacing or repairing.

I will begin any testing that may be required, remove and replace any equipment and components that may be faulty. Once all the faults have been resolved, I will start to begin with the maintenance activity. If diagnosis is not appropriate, then I will proceed to follow the maintenance schedule as listed in the manual and record my findings and diagnose as I go.

Once I am happy with this, I will switch off the supply. I will lock off the supply to ensure it cannot be re-energised whilst I am working on it. I will proceed to clean down the lathe machine as part of maintenance to prevent any debris from getting inside the milling machine when the sub-assemblies/covers are removed.

Once I am happy the lathe machine is cleaned, I will remove any sub-assemblies to gain access to the components as appropriate. I will visually inspect the components and wiring of the lathe machine to ensure all connections are electrically sound and that no damage or wear and tears are visible.

I will also check all gears and surfaces for wear, tear and lubrication (middle drive gear lost teeth), lubricating with the appropriate grease or oil (as per the specification). I will check the entire lathe machine, assemblies and subassemblies for security and tightness, if any fastenings/fixing are showing signs of wear and tear then these will be replaced as appropriate. Inspection of the gears in the back panel of the lathe (opposite Chuck) will need to be checked to see if any gears have debris on them or any sign of wear such as broken teeth which was shown on the middle nylon.

During this maintenance I will need to check the running of and replace the lubricating cutting fluid. To do this I need to drain the lubricating cutting fluid from the reservoir and gain the appropriate access to catch the fluid. I will clean the reservoir tank and refill the cutting fluid, checking the PH with the dip sticks and refractometer. Once this has been done and safely stored, I can proceed to remove, inspect for filings and replace the gearbox oil.

The reason for checking for filings is to indicate excessive wear on the gears. Then this will need to be assembled and tightened in accordance with the manual. I will dismantle the X and Y axis worm gears housing and check the tolerance values for backlash adjusting the lead screws to correct tolerance values. I will proceed to check the bed is true and level using a spirit level, feeler gauges and an engineer's square.

Once I am happy, I will reassemble the lathe in the correct order, torquing up the main fixings to the appropriate torque (80nm). The sub-assemblies are mainly nuts and bolts and these

will be tightened as per the manufacturer's specification.

Another very important process to be followed is to ensure all greased components are cleaned off and re-greased. The same applies to the oiled surfaces. It is important to clean and reapply the oil and grease as it likely contains debris and carbon deposits from general use of the machine. As it is high temperature grease, it can become hard/waxy over time, which could cause seizing of important components if not refreshed. I will then re-energise the lathe machine and complete a function check to ensure the lathe machine is operating correctly.

3. Post-maintenance

Once I am satisfied that the maintenance has been completed, I will tidy up my work area and ensure that all tools and equipment are free from damage before returning to dedicated storage. I will clean my area and dispose of waste correctly, ensuring any disposal and regulatory requirements are followed.

I will then handover the lathe machine to the assessor, demonstrating the lathe machine functionality and condition as part of the handover agreement. I will complete any necessary paperwork and amend any documentation that may need amending, before handing this over to the supervisor.

Task 4 Handover

Assessment number (eg 1234-033)	8712-311
Assessment title	Mechanical Occupational specialism

Candidate name	<first name> <surname>
City & Guilds candidate No.	ABC1234

Provider name	<provider name>
City & Guilds provider No.	999999a

Task(s)	4
Evidence title / description	Handover Documentation (see task 2) Practical observation form
Date submitted by candidate	DD/MM/YY

Task 4

Assessment themes:

- Health and safety
- Reviewing and reporting

You must now hold a meeting with the supervisor to return to service and complete handover procedures, including:

- demonstration of machine functionality
- confirmation of work completed
- amended method statement and how you addressed peer review feedback, including any suggested changes that were not made and why
- appropriate handover documentation.

Additional evidence of your performance that must be captured for marking:

none

Task 4 Practical observation form

8712-311 Maintenance Engineering Technologies: Mechanical - summer 2024

Candidate Name	Candidate number
Provider name	Date

Complete the table below referring to the relevant marking grid, found in the assessment pack.

Do not allocate marks at this stage.

This observation must cover	Assessor observation should include:	Assessment Themes
Handover	<ul style="list-style-type: none"> the handover of the work completed. 	<ul style="list-style-type: none"> Health and Safety Reviewing and Reporting

Notes – detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.

Handover

Candidate was wearing the correct PPE throughout the handover process and all handover documentation was made available digitally. Candidate gave a confident delivery of the work he had carried out describing all tasks clearly. He described the faults he had found and how he rectified them, although the check of the bearings was only described briefly. The tasks he carried out for the general service of the lathe were described in sufficient detail. He did run up the lathe to show it was operational but did not turn on the coolant to prove it was in good working order.

Internal assessor signature	Date
XXX	XXX

Get in touch

The City & Guilds Quality team are here to answer any queries you may have regarding your T Level Technical Qualification delivery.

Should you require assistance, please contact us using the details below:

Monday - Friday | 08:30 - 17:00 GMT

T: 0300 303 53 52

E: technical.quality@cityandguilds.com

W: <http://www.cityandguilds.com/tlevels>

Web chat available [here](#).

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