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NATIONAL OCCUPATIONAL CURRICULUM
CONTENT FOR APPRENTICES OF THE 21st
CENTURY
(NOCC-A21)

MECHANICAL FITTER
CURRICULUM CODE: 653303000
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INTRODUCTION

Overview

The NOCC-A21 for Mechanical Fitter comprises three training years and is constructed in a way which will result in apprentices spending 62% their time in the workplace and 38% of their time at the skills development provider over a training period of 3 years.

Years	Skills Development Provider (SDP) Time in working days ¹	Workplace Time in working days
Year 1	109 (47%)	121 (53%)
Year 2	86 (37%)	144 (63%)
Year 3	67 (29%)	163 (71%)
Total Training Time	262	428
Total percentage split	38%	62%

As stipulated above, apprentices in **Year 1** still spend a significant amount of their time at the training provider (**47%**) in order to gain the important foundations in the trade. The time spent at the training provider then reduces considerably over the remaining two years (**Year 2: 37% and Year 3: 29%**) in order to ensure as much productive time in the workplace as possible.

The entire set-up of NOCC-A21 is work-driven and practical, and thus conceptualised around real life work situations in the relevant trade. The NOCC-A21 is made up of broad **learning areas**, which are then sub-divided into smaller **work situations**.

Learning areas (LA) are overarching themes of learning derived from a common work area e.g. 'Perform work activities on drives and gear boxes'. Each learning area is made up of a number of work situations.

Work situations (WS) are the next smaller unit of learning, i.e. the work-related situations that an apprentice would typically find him/herself in. For example, 'Perform routine maintenance, fault finding, repair and alignment on gearboxes'. Work situations are the underlying work activities that will help the apprentice to develop the required proficiency of the learning area.

Both learning areas and work situations are included in a **NOCC-A21 Profile**, which demonstrates the learning, which needs to be covered over the course of the training programme. Please see the NOCC-A21 profile for your specific trade on the next page.

The Mechanical Fitter trade is a stand-alone trade but also forms part of the Fitter and Turner and Millwright trades, which are dual trades. The NOCCs for the three trades have been aligned to enable joint delivery of the training for the mechanical fitting component. Work situations that are aligned are indicated in the NOCC-A21 profile for the three trades and the number of shared work situations per trade is provided for cross-reference purposes.

¹ A working day is calculated as being 8 hours. Total maximum working days per year are assumed to be 230 days.

Mechanical Fitter NOCC-A21 Profile

Learning areas		Work Situations					
A	Practice the occupation and behave responsibly and professionally in the workplace	A1 Receive an induction and orientation to the occupation and the training programme (Fitter and Turner A1 & Millwright A1)	A2 Behave ethically and communicate professionally in the workplace (Fitter and Turner A2 & Millwright A2)	A3 Manage personal finances (Fitter and Turner A3 & Millwright A3)	A4 Plan for work activities and manage time effectively (Fitter and Turner A4 & Millwright A4)	A5 Use personal computer systems (Fitter and Turner A5 & Millwright A5)	A6 Prepare for job search, CV writing and job interviews (Fitter and Turner A5 & Millwright A6)
B	Conduct preparatory and quality assurance activities	B1 Read, interpret and produce freehand as well as accurate basic 2 and 3 dimensional engineering drawings of mechanical components (Fitter and Turner B1 & Millwright C1)	B2 Identify, handle and store relevant engineering materials (Fitter and Turner B2 & Millwright D5)	B3 Apply trade calculations in job tasks (Fitter and Turner B3 & Millwright C3)	B4 Understand and apply basic mechanical theory (Fitter and Turner B4 & Millwright C4)	B5 Work to company and industry quality standards (Fitter and Turner B5 & Millwright C6)	B6 ELECTIVE: Read and produce computer aided design (CAD) drawings (Fitter and Turner B5 & Millwright NONE)
C	Comply with health and safety practices	C1 Adhere to OHS and perform risk assessment and lock-out and tag out procedures (Fitter and Turner C1 & Millwright B1)	C2 Perform first aid and fire fighting (Fitter and Turner C2 & Millwright B2)	C3 Work safely and correctly with basic hoisting & lifting equipment (up to 2.5 tons) (Fitter and Turner C3 & Millwright B3)	C4 Work safely at heights and in confined spaces as well as in & near excavations (Fitter and Turner C4 & Millwright B4)	C5 Perform housekeeping and resource efficient and environmentally friendly waste removal (incl. storage of hazardous materials) (Fitter and Turner C5 & Millwright B5)	

D	Select, care for and use hand tools, power tools and machinery	D1 Handle, care for basic hand tools (Fitter and Turner D1 & Millwright D1)	D2 Handle, care for engineering power tools (portable and fixed) (Fitter and Turner D2 & Millwright D2)	D3 Identify and care for marking and mechanical measuring equipment (Fitter and Turner D3 & Millwright D3)				
E	Fabricate a range of simple mechanical components or work pieces	E1 Mark-off, saw and file various simple components and materials (Fitter and Turner E1 & Millwright E1)	E2 Sharpen drill bits according to application and drill material to specifications using a portable and fixed drilling machine (Fitter and Turner E2 & Millwright E2)	E3 Saw material to specification using a power saw (Fitter and Turner E3 & Millwright E3)	E4 Grind material to specifications using a pedestal grinder (Fitter and Turner E4 & Millwright E4)	E5 Cut threads with stocks, dies, taps and ream parallel and tapered holes (Fitter and Turner E5 & Millwright E5)		
F	Fabricate complex mechanical components or work pieces	F1 Fabricate and fit a gasket (Fitter and Turner F1 & Millwright F1)	F2 Fabricate and fit keys and locking devices (Fitter and Turner F2 & Millwright F2)	F3 Fabricate a flange and other suitable components (Fitter and Turner F3 & Millwright F3)				
G	Perform basic welding, cutting, brazing on engineering materials	G1 Gas cut metal to specification (Fitter and Turner G1 & Millwright G1)	G2 Arc weld metal to specification (Fitter and Turner G2 & Millwright G2)	G3 Gas weld, silver solder and braze metal to specification (Fitter and Turner G3 & Millwright G4)				
H	Perform work activities on gearboxes and drives	H1 Perform routine maintenance, fault finding, repair and alignment on gearboxes (Fitter and Turner H1)	H2 Perform routine maintenance, fault finding, repair and alignment on drives (Fitter and Turner H2)	H3 Install, align and commission gearboxes to specification (Fitter and Turner H3)	H4 Install, align and commission drives to specification (Fitter and Turner H4 & Millwright N4)	H5 ELECTIVE: Perform laser alignment on drives and gear boxes (Fitter and Turner H5 & Millwright N5)		

		& Millwright N1)	& Millwright N2)	& Millwright N3)				
I	Perform work activities on pumps for water systems and water related valves	I1 Perform routine maintenance fault finding, repair and reassembly activities on pumps for water systems (Fitter and Turner I1 & Millwright O1)	I2 Perform routine maintenance fault finding, repair and reassembly activities on water related valves (Fitter and Turner I2 & Millwright O2)	I3 Install, align and commission pumps for water systems and water related valves (Fitter and Turner I3 & Millwright O3)				
J	Perform work activities on brakes and clutches	J1 Perform routine maintenance, fault finding, repair, reassembly and alignment activities on brakes and clutches (Fitter and Turner J1 & Millwright P1)	J2 Perform installation and commissioning activities on brakes and clutches (Fitter and Turner J2 & Millwright P2)					
K	Perform work activities on bearings and lubrication systems	K1 Perform routine maintenance, fault find, repair and align bearings (Fitter and Turner K1 & Millwright Q1)	K2 Perform routine maintenance, fault find, repair and align lubrication systems (Fitter and Turner K2 & Millwright Q2)	K3 Perform installation and commissioning activities lubrication systems (Fitter and Turner K3 & Millwright Q3)	K4 Perform installation and commissioning activities on bearings (Fitter and Turner K4 & Millwright Q4)			
L	Perform work activities on hydraulic systems	L1 Build and test basic hydraulic flow circuits (Fitter and Turner L1 & Millwright M1)	L2 Perform routine maintenance, fault finding, repair and reassembly activities on hydraulic systems (Fitter and Turner L2 & Millwright M3)	L3 Perform installation and commissioning activities on hydraulic systems (Fitter and Turner L3 & Millwright M5)	L4 ELECTIVE: Perform basic activities on electro hydraulic systems (Fitter and Turner L4 & Millwright NONE)			

M	Perform work activities on pneumatic systems	M1 Build and test basic pneumatic circuits (Fitter and Turner M1 & Millwright M2)	M2 Perform routine maintenance, fault finding, repair and reassembly activities on pneumatic systems (Fitter and Turner M2 & Millwright M4)	M3 Perform installation and commissioning activities on pneumatic systems (Fitter and Turner M3 & Millwright M6)	M4 ELECTIVE: Perform basic activities on electro pneumatic systems (Fitter and Turner M4 & Millwright NONE)			
N	Inspect, maintain and fault find on conveyor systems	N1 Inspect, maintain conveyor systems (incl. rolling elements, structure and belts) and inspect safety guards and shout (Fitter and Turner N1 & Millwright R1)	N2 Track conveyor belts (Fitter and Turner N2 & Millwright R2)	N3 ELECTIVE: Remove and replace conveyor belts / splicing (excluding vulcanization (vusing)) (Fitter and Turner N3 & Millwright R3)				
Reinforce skills and prepare for the trade test								

The details of the actual learning content for each **Work situation** are defined in a **Learning Package**. The learning package includes a number of components as can be seen in the template in the box below.

Component A is a **work scenario** which locates the learning in everyday workplace activities. The work scenario for each work situation brings the curriculum alive by showing how the learning in that situation links to real work. The work scenario also supports a teaching methodology that ensures that industry work processes are integrated into the classroom.

Component B is the **integrated learning content**. This defines the practical skills, underpinning knowledge and the work experience (with relevant QCTO codes) required to perform the tasks contained within a work situation and links the NOCC-A21 back to the QCTO curriculum framework.

Each learning package also includes **Component C** on **internal assessment** to be performed (based on the assessment criteria contained), which can support the facilitator in designing the assessment for each learning package. **Component D** identifies the **learning resources** that can be used to teach the learning package. In addition, in **Component E** the **Tools, Equipment and Materials** required for each Learning package are listed. A consolidated tools and equipment list with a toolbox list is included towards the end of the document.

Also included in each learning package is a list of other learning package(s) which need to have been covered before the current learning package can be taught (**pre-requisite learning**), **Component F**.

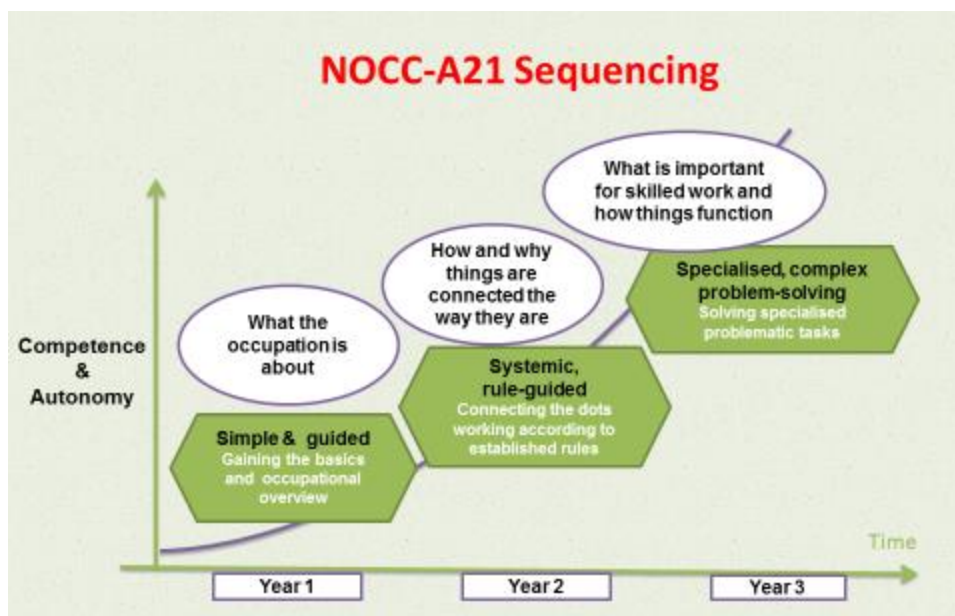
Integration, scaffolding and sequencing of learning

An important design principle of the NOCC-A21 is that it incorporates practical skills, underpinning knowledge and workplace experience in a single, integrated learning programme. These three elements are included in each learning package instead of being separated into consecutive phases as theory and practice previously were in apprenticeships.

The work situations that make up the curriculum are designed to be taught in an integrated rather than linear fashion. While each work situation has a distinct focus, there is an overlap between them as some work situations develop foundational knowledge and skills for others. This means that some foundational knowledge and skills might be introduced in one work situation, but reinforced and further developed in another (e.g. OHS, Professional communication and work ethics, Housekeeping, Company and quality standards, etc.).

NOCC-A21 Learning Package			
Occupation/trade title:	SAQA ID:		
	Curriculum code:		
Learning area title:	Total hours	SDP	WP
Work situation title:	Total hours		
COMPONENT A: Work scenario:			
COMPONENT F: Prerequisite learning:			
COMPONENT B: INTEGRATED LEARNING CONTENT			
Practical skills modules (PM)	Knowledge modules (KM)	Work experience modules (WM)	
The apprentice must be able to:	Knowledge of:	The apprentice will be expected to engage in the following work activities:	
ASSESSMENT CRITERIA			
Component C: Internal Assessment to be performed:			
Component D: Learning resources for teaching			
Component E: Tools, Equipment and Materials			

Scaffolding is another design feature of the NOCC-A21. This informs the sequencing and teaching of the curriculum. A scaffolded approach is one that lays down foundational knowledge and skills, and progressively moves learners to more complex understanding and practice. Strong support and guidance are initially provided but are slowly removed as the learner becomes more competent and independent. This is like physical scaffolding in construction, which is incrementally removed as it is no longer needed. In the teaching of the NOCC-A21, the activities that students engage in should move from simple and guided in the first year, to systematic rule-guided in the second year, and finally to complex and problem solving in the third year.



Suggested sequencing

The tables that follow provide a suggested sequencing of the work situations over the entire training programme. The suggested sequencing is not cast in stone and may be adapted as per the needs of each training provider. However, two principles need to be adhered to, when adapting the suggested sequence:

- 1) The **pre-requisite learning** for each learning package (Component F) must be in place before a learning package can be taught.
- 2) **At the end of each training year** all identified work situations need to be covered in order to ensure the same learning outcome for all apprentices.

Sequencing: Mechanical Fitter

YEAR 1					YEAR 2					YEAR 3				
LA/WS	Work situation title	SDP	WP	Prerequisite	LA/WS	Work situation title	SDP	WP	Prerequisite	LA/WS	Work situation title	SDP	WP	Prerequisite
A1	Receive an induction and orientation to the occupation & the training programme	16	16	None	H1	Perform routine maintenance, fault finding, repair and alignment on gearboxes	40	120	Year 1	N1	Inspect, maintain conveyor systems (incl. rolling elements, structure and belts) and inspect safety guards and shout	40	160	Year 2
C1	Adhere to OHS and perform risk assessment and lock-out and tag out procedures	24	24	A1	I1	Perform routine maintenance fault finding, repair and reassembly activities on pumps for water systems	40	120	Year 1	N2	Track conveyor belts	8	40	N1
C2	Perform first aid and fire fighting	24	24	C1	J1	Perform routine maintenance, fault finding, repair, reassembly and alignment activities on brakes and clutches	40	120	Year 1	N3	ELECTIVE: Remove and replace conveyor belts / splicing (excluding vulcanization (vusing))	24	40	N2
A2	Behave ethically and communicate professionally in the workplace	16	CC	A1	H2	Perform routine maintenance, fault finding, repair and alignment on drives	80	120	Year 1; H1	H5	ELECTIVE: Perform laser alignment on drives and gearboxes	40	40	Year 2
A3	Manage personal finances	8	CC	None	I2	Perform routine maintenance fault finding, repair and reassembly activities on water related valves	32	80	I1;	B6	ELECTIVE: Read and produce computer aided design (CAD) drawings	80	80	Year 2
A4	Plan work activities and manage time effectively	16	CC	A1	H3	Install, align and commission	24	40	H1; H2;	M4	ELECTIVE: Perform basic activities on	80	80	M1-M3

						gearbox to specifications					electro pneumatic systems			
A5	Use personal computer systems	40	CC	A1	H4	Install, align and commission drives to specification	40	40	H2; H3	A6	Induction: Job searching skills, CV writing, Job interviews	24	CC	All
B1	Read, interpret and produce freehand as well as accurate basic 2 and 3 dimensional engineering drawings of mechanical components	24	CC	A1	I3	Install, align and commission pumps for water systems and water related valves	40	40	I2	Trade test prep	Reinforce skills and prepare for the trade test	240	864	All
D1	Handle and care for basic hand tools	16	16	B1; A1	J2	Perform installation and commissioning activities on brakes and clutches	16	40	J1					
D2	Select and care for engineering power tools (portable and fixed)	16	16	A1; C1; D1	K3	Perform installation and commissioning activities on lubrication systems	8	32	Year 1					
D3	Identify, care and use marking and mechanical measuring equipment	24	16	C1; A1; D1-D2	K4	Perform installation and commissioning activities on bearings	16	40	Year 1					
B2	Identify, handle and store relevant engineering materials	8	8	D1	L1	Build and test basic hydraulic flow circuits	80	80	Year 1					
C4	Work safely at heights and in confined spaces as well as in & near excavations	40	24	A1, C1	M1	Build and test basic pneumatic circuits	64	80	Year 1					
C5	Perform housekeeping and resource efficient environmentally friendly waste removal (incl. storage	8	CC	A1, B2, C1; D1	L2	Perform routine maintenance, fault finding, repair and reassembly activities on hydraulic systems	40	40	L1					

	of hazardous materials)													
B3	Apply trade calculations in job tasks	16	CC	B1	M2	Perform routine maintenance, fault finding, repair and reassembly activities on pneumatic systems	40	40	M1					
B4	Understand and apply basic mechanical theory	40	CC	B1; D1-D2	L3	Perform installation and commissioning activities on hydraulic systems	24	40	L2					
B5	Work to company and industry quality standards	24	CC	A1, C1; B1	M3	Perform installation and commissioning activities on pneumatic systems	24	40	M2					
E1	Mark-off, saw and file various simple components and materials	72	80	D1;D3	L4	ELECTIVE: Perform basic activities on electro hydraulic systems	40	40	L3					
E2	Sharpen drill bits as per application and drill material to specifications using a portable and fixed drilling machine	16	40	D2-D3										
E3	Saw material to specification using a power saw	8	24	D1-D3										
E4	Grind material to specifications using a pedestal grinder	24	40	D1-D3										
E5	Cut threads with stocks, dies and taps and ream parallel and tapered holes	40	80	D1-D3; E1-E2										
F1	Fabricate and fit gaskets	16	40	E; D										

F2	Fabricate and fit keys and locking devices	80	80	E; D; B										
F3	Fabricate a flange & other suitable components	80	80	E; D; B										
G1	Gas cut metal to specification	16	40	E; D; B										
G2	Arc weld metal to specification	40	80	E; D; B										
G3	Gas weld, silver solder and braze metal to specification	24	80	E; D; B										
K1	Perform routine maintenance, fault find, repair and align bearings	24	80	A1, B2, B3- B5, D+E										
K2	Perform routine maintenance, fault find, repair and align lubrication systems	32	80	A1; A4; B; D; E										
C3	Work safely and correctly with basic hoisting & lifting equipment (up to 2.5 tons)	40	CC	A1, A4; B2; B4; C1; C5; D1										
	TOTALS	872	968	1840		TOTALS	688	1152	1840		TOTALS	536	1304	1840

CC – Cross cutting. This set of skills needs to be pursued throughout the learning programme. Even though this learning package has not been allocated specific hours in the workplace, please spend a minimum of 1 hour discussing this to make the apprentice conscious on the importance of these skills in the workplace.

Development of correct attitudes and attributes

Practicing apprentices need a set of core attitudes and attributes to competently perform their trade in a workplace. These cut across and need to be built into the teaching of each work situation. The core attitudes and attributes are:

- Follow instructions correctly
- Pay attention to detail and work accurately
- Be quality conscious
- Work tidily
- Be time conscious and work under pressure
- Ensure safety
- Perform as a team player
- Demonstrate customer orientation
- Be aware of the need to work in a manner that protects the environment
- Adhere to company rules and standards
- Work independently within the requirements of the job
- Take responsibility for ones work

Rotation between the SDP and the workplace

The apprentice is expected to spend 30% to 40% of the time at the SDP and 60% to 70% of the time at the workplace, over the three years. At the SDP the apprentice should spend at least 50% of the time in the workshop applying the theory that has been learnt. The rotation between the SDP and the workplace should occur in a series of blocks which may be between 8-12 weeks long, in the first year, but by third year the blocks will reduce to 4-8 weeks at the SDP and increase to 12-16 weeks at the workplace. The logbook will detail the suggested rotation schedule and workplace activities.

Entry requirement

The entry requirement for this trade is: Grade 9 (NQF Level 1)

Learning and teaching materials

The materials developed to deliver the respective learning programme will include:

- An apprentice guide that includes material that supports the learning of each learning package
- A training provider guide that supports the teaching of the theory and practical components of the programme
- An employer guide that supports the delivery of the workplace experience component of the programme
- An apprentice logbook for guiding and signing off the workplace experience
-

Link to QCTO curriculum document

The NOCC-A21 has been developed to enable the implementation of the QCTO occupational qualification for the relevant trade.

To facilitate alignment with the QCTO curriculum for the trade, the knowledge, practical skills and work experience included in learning packages derives from this. In some cases the content included from the QCTO curriculum has been supplemented to create a full learning package for a work situation that includes knowledge, practical skills and work experience. A few learning packages also contain content that is additional to the QCTO curriculum. The work situations addressed by these learning packages were added to address gaps identified by the industry experts, who assisted with the development of the NOCC-A21. Content in learning packages that comes from the QCTO curriculum can be identified by the curriculum codes. Content that is supplementary has no code and is included in red.

A full cross referencing between the QCTO curriculum and the NOCC-A21 is provided in the cross referencing table in a separate document.

In addition to working with the NOCC-A21, training providers also need to familiarise themselves with the QCTO qualification and curriculum documents for the trade.

Assessment

NOCC-A21 assessment should be geared towards developing competent apprentices. Competent apprentices have relevant trade-related practical skills and sound knowledge underpinning their skill-sets. This enables them to understand what they are doing and why, and to make appropriate decisions and solve problems. Both their knowledge and skills thus need to be assessed. The learning package for each work situation includes assessment criteria for the knowledge and skills developed in that situation. Guidelines have been provided in each learning packages for the internal knowledge and practical assessment.

The assessment of the occupational programme includes internal and external assessment activities. Training providers are responsible for internal continuous assessment, which should be carried out throughout out each year of the programme.

It is recommended that the internal continuous assessments are planned in **at the end of each training week**. Each Friday the content of the specific week would be assessed. This allows both apprentices and facilitators to determine the current level of comprehension, and whether any remedial work is required. If the week has covered several learning packages, the content of the assessment would cover the different learning packages. If only one learning package was covered, the assessment would focus on this specific package.

The final external assessment to be completed is the trade test. Six to eight weeks trade test preparation has been included in the NOCC, wherein the facilitator and mentor can support the apprentice to prepare for this final external assessment. As per the QCTO assessment specifications, the apprentice should be competent in:

- Apply hand skills to fabricate mechanical components using engineering tools
- Perform engineering maintenance on mechanical components, subassemblies and machines
- Repair, install and commission subassemblies and machines
- Machine mechanical components using machining tools and equipment

When an apprentice has completed the occupational programme and is considered competent, s/he need to pass the trade test at a registered trade testing centre to be awarded their qualification.

Human Resources

The human resources required for each of the components, practical, knowledge and workplace experience is noted below.

Human Resource Requirement for Practical skills modules:

- Trade tested in the related trade
- 3-5 years post trade test relevant work experience and knowledge and experience on the topic to be covered
- Trainer/ apprentice ratio 1:15
- Facilitators must be suitably qualified in facilitation and assessment of trade qualifications.
OR Must have qualified in DHET preparatory programme for delivery of occupational programmes (facilitation and assessment)

Human Resource Requirement for Knowledge modules:

- Facilitator must be trade tested in the related trade
- Facilitator must have relevant industry experience and knowledge and experience on the topic to be covered
- Facilitators must be suitably qualified in facilitation and assessment of trade qualifications.
OR Must have qualified in DHET preparatory programme for delivery of occupational programmes (facilitation and assessment)
- Facilitator/ learner ratio 1:30

Human Resource Requirement for Work experience modules:

- Mentor must be trade tested in the related trade
- Mentors must be suitably qualified in mentoring and be able to support the apprentices in trade test preparation.
- 3-5 years post trade test relevant work experience
- Mentor/ apprentice ratio 1:3

List of acronyms

AK	Applied knowledge
CAD	Computer aided design
KM	Knowledge module
KT	Knowledge topic
NAMB	National Artisan Moderation Body
NOCC	National Occupational Curriculum Content
OHS	Occupational Health and Safety
PA	Practical activity
PM	Practical module
PPE	Personal Protective Equipment
PS	Practical skill
QCTO	Quality Council for Trades and Occupations
SABS	South African Bureau of Standards
SANS	South African National Standards
SAQA	South African Qualifications Authority
SOP	Standard operating procedure
WA	Work activity
WE	Work experience
WM	Work experience module

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>A1</h1>
		Curriculum code: 653303000		
Learning area title: Practice the occupation and behave responsibly and professionally in the workplace	Total hours	SDP	WP	
		120	16	
Work situation title: Receive an induction and orientation to the occupation and the training programme (incl. Apprentice contracts)	Total hours	16	16	
Work scenario: Thembi is starting as a new apprentice in the Mechanical Fitter trade. It is her first day in the training programme. She does not yet have a full understanding of what lies ahead of her over the next 4 years and wants to understand the contracts that she must sign, how the rotation plan will work and how to complete the logbook.				
Prerequisite learning: None				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p><i>QCTO none</i></p> <p><i>Given learnership agreement, QCTO qualification (source access), NOCC-A21, the rotation scheme and logbook</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Explain the purpose of their training and how it will unfold • Demonstrate the use of the logbook by filling in sections. <p><i>Given apprenticeship contracts, relevant legislation and code of conduct, case studies demonstrating the contravening of contracts/legislation/regulations</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Complete and sign an apprenticeship 	<p>Knowledge of:</p> <p>KM-01-KT01 Introduction to the Mechanical Fitting trade</p> <ul style="list-style-type: none"> • KT0101 Career opportunities for a qualified mechanical fitter • KT0102 Occupational profile of a mechanical fitter • KT0103 Legislation related to apprentices in the fitting and turning trade <p>Employer-Employee relationship</p> <ul style="list-style-type: none"> • Employment contracts including learning contracts such as learnerships, apprenticeships and internships • Mandates, vision, mission, policies and procedures • Rules, codes of conduct and ethics • Organisational values, common and 		<p><i>QCTO none</i></p> <p>The apprentice will be expected to engage in the following work activities:</p> <ul style="list-style-type: none"> • Attend medical assessment (pre-placement) and physical assessment • Induct apprentice to company-vision/mission, specific structures and procedures • Introduce apprentice to the team • Explain to apprentices and co-workers the aims of the training programme • Provide an overview of on-the-job experience programme (rotation scheme) • Induction to general work place policies, procedures and standards (e.g. SANS) which will need to be 	

<p>contract</p> <ul style="list-style-type: none"> • Explain the contractual roles and responsibilities of the different role players in the training, and particularly their own • Read and obtain an overview of employment legislation relevant to their contracts • Demonstrate an understanding of the process to be followed in terms of laying a grievance • Demonstrate an understanding of the processes that need to be followed in the event of disciplinary procedures • Explain the importance of a code of conduct and the need to comply with the ethics and value of the company <p><i>Given case study with non-compliance scenarios at employer and/or training provider.</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Correctly identify non-compliance and explain remedial action <p><i>Given promotional image videos showing Mechanical Fitters in the workplace, Career pathway charts, Career stories of successful Mechanical Fitters</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Identify the world of work of a Mechanical Fitter • Understand the importance of Mechanical Fitters for society and industry 	<p>specific</p> <ul style="list-style-type: none"> • Labour relations processes, including discipline, grievance, strikes, lock outs, negotiation, conciliation, mediation and arbitration • Learnership agreements (apprenticeship contracts which includes the contractual obligations of apprentices, employers and skills development providers) • Need for contracts, legislations and regulations • Employment legislation (Workman’s Compensation Act; Basic Conditions of Employment Act; Labour Relations Act; Collective Bargaining agreements; Employment Equity Act; Broad-Based-Black Economic Empowerment Act). • Unemployment Insurance Fund (UIF) and Pay As You Earn (PAYE) tax • The purpose and importance of the logbook • The rotation schedule • Unfair labour practices • Determination of wages in the project • Consequences of breaching contractual obligations • Company-specific processes/procedures related to legislative requirements • The importance of adhering to the company code of conduct/ethics • The importance of a Mechanical Fitter in society • Work roles of Mechanical Fitters in 	<p>adhered to</p> <ul style="list-style-type: none"> • Clarify apprentices role and responsibilities in the company • Provide an overview of core work areas of the company • Introduce the allocated supervisors/mentors and clarify reporting structures • Structured discussion on contractual obligations for apprentice and employer by going through the relevant contracts and company policies and procedures • Feedback session with the apprentice reflecting on adherence to contractual obligations at the end of company phase
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<ul style="list-style-type: none"> Acknowledge the physical work environment of a Mechanical Fitter (locations, hazards, discomforts, working hours) and the importance of SANS 	<p>different industry sectors (job descriptions incl. work locations)</p> <ul style="list-style-type: none"> Different areas of specialisation for Mechanical Fitters(occupational titles) The importance of occupational pride Typical work schedules in industry (part-time, full time, overtime, shift-work, job-sharing etc.) 	
ASSESSMENT CRITERIA		
<p>Case study with non-compliance scenarios of employer, training provider. Apprentice to correctly identify non-compliance and explain remedial action</p>	<ul style="list-style-type: none"> The job environment and roles of a mechanical fitter is accurately described and explained The profile of a mechanical fitter is described with respect to industry description and requirements Legal aspects pertaining to apprentices are explained Describe the processes which govern employer-employee relation Describe and explain the current trends affecting organisations and employees Discuss the impact of these factors on an employer and an employee 	<p>Supporting Evidence</p> <ul style="list-style-type: none"> Proof of induction session and related documents including rotation scheme and allocated mentors Proof of structured conversation on contractual obligations Proof of feedback session with the apprentice reflecting on adherence to contractual obligations at the end of company phase
<p>Internal Assessment to be performed:</p> <ul style="list-style-type: none"> Internal multiple choice knowledge test on compliant/non-compliant case scenarios, remedial action procedures The competency will be at 100% Signed off attendance register for induction 		

Learning resources for teaching

- Textbooks on defined Knowledge Modules
- Learnership agreements
- QCTO qualification (source access), NOCC-A21, the rotation scheme, logbook format
- Promotional image videos showing Mechanical Fitters in the workplace
- Charts and diagrams of the structure of the sector
- Samples of company codes of conduct
- Samples of company policies, rules and regulations

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>A2</h1>
		Curriculum code: 653303000		
Learning area title: Practice the occupation and behave responsibly and professionally in the workplace	Total hours	SDP	WP	
		120	16	
Work situation title: Behave ethically and communicate professionally in the workplace (incl. attitude/motivation)	Total hours	16	CC	
Work scenario: Kagiso is a Mechanical Fitter apprentice fresh from school and is not familiar on how to behave professionally in a workplace. The rules and systems seem so different to anything she has encountered either in her school or her private life. She receives an induction into the workplace on how to behave and communicate professionally, the expected work ethics and how to display the right attitude and motivation.				
Prerequisite learning: A1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>QCTO none</p> <p><i>Given various ethical, communication and conflict scenarios/tasks with various stakeholder groups (internal and external, on different hierarchical levels)</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> Identify appropriate and inappropriate ethical behaviour and the consequences thereof for the business <p>Identify appropriate communication procedures</p> <ul style="list-style-type: none"> Identify appropriate ways of communication with colleagues and managers Identify appropriate ways of communication with external stakeholders 	<p>Knowledge of:</p> <p>Ethics at work</p> <ul style="list-style-type: none"> Definition of ethical behaviour Components of ethical behaviour, including integrity, honesty, fair dealing, respecting diversity Unwritten but expected behaviours including reliability, accountability, time keeping, respect for others Lapses in ethical behaviour, including sexual harassment, racism, bullying, theft and abuse of company property, rules, time and sick leave Conflicts of interest, including primary and secondary interests, the impact on individuals and organisations, and the link to corruption The need for ethical behaviour and the 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <ul style="list-style-type: none"> Identify and clarify the work ethics applicable to the company Identify and clarify organisational requirements and workplace procedures related to internal and external communication Answer telephone calls and take messages (if possible) <p>WM-01-WE03 Work as a member of a team</p> <ul style="list-style-type: none"> WA0301 Provide support to co-employees when required or requested 	

<p>Communicate positively in the workplace and with clients</p> <ul style="list-style-type: none"> • Use effective questioning, active listening and conversational skills to gather and convey information • React appropriately to given instructions (verbally and in writing) • Encourage, acknowledge and act upon constructive feedback • Use appropriate non-verbal behaviour • Demonstrate work site etiquette from arrival to departure (blocking driveways, movement inside work site, respecting other people's space, cleaning after work etc.) <p>Communicate via phone/smartphones and email in a business context:</p> <ul style="list-style-type: none"> • Take telephonic messages and handle basic client inquiries • Leave concise voicemails to communicate information • Write business emails and respond to email inquiries • Demonstrate acceptable usage and communication through smartphone technologies/applications (e.g. whatsapp) – incl. time of day <p>Teamwork</p> <ul style="list-style-type: none"> • Identifies team members and supervisors according to the scope of work • Shares job instructions with colleagues • Coordinates tasks with colleagues 	<p>impact or consequences of lapses in ethical behaviour</p> <p>Professional Communication techniques including:</p> <ul style="list-style-type: none"> • Recognition of different personal communication styles appropriate to individual, social and cultural backgrounds • Giving and receiving constructive feedback • Verbal and non-verbal communication: • Use of positive and confident language • Body language • Use of communication media in business: • Telephones (including smartphones) • Communication on social media • Email • Characteristics of professional and positive communication • Methods of recording and communicating information (toolbox talk, job cards link back to A2) • Sender and receiver problem <p>Types of internal and external clients including:</p> <ul style="list-style-type: none"> • Clients from different backgrounds (e.g. social, cultural, religion, etc.) • Outside contractors • Suppliers • Supervisors/Manager • Colleagues <p>Team work and professional behaviour in</p>	<ul style="list-style-type: none"> • WA0302 Comply with work place rules and, or codes of conduct <p>WA-06-WE01: Work as a team member in different roles, including directing work teams or personal assistants</p> <ul style="list-style-type: none"> • WA0101 Act as a team leader for at least two specific projects in the workplace • WA0102 Report on work progress and achievement within target dates for specific problems • WA0103 Demonstrate the ability to respond constructively to problems experienced in the workplace and to provide guidance when required <ul style="list-style-type: none"> • Works as a team member • Identifies team members and supervisors according to the scope of work • Shares job instructions with colleagues • Coordinates tasks with colleagues • Supports the team in achieving production targets, quality standards and a safe workplace <p>WM-06-WE02: Participate in and contribute to workplace meetings</p> <ul style="list-style-type: none"> • WA0201 Attend at least 4 planning meetings and contribute to planning of and reporting on work activities
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<ul style="list-style-type: none"> • Demonstrates effective team work qualities 	<p>a team:</p> <ul style="list-style-type: none"> • The importance of team work and the different role of team members • How to work successfully in a team • Productive and counterproductive team behaviour <p>Attitude and Motivation:</p> <ul style="list-style-type: none"> • How your attitude influences your motivation • Goal setting and drivers for success • Inhibitors/challenges on the way to success and how to deal with them (how one sabotages oneself) 	<ul style="list-style-type: none"> • WA0202 Attend and contribute to at least one meeting where workplace costs are addressed <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Reporting channels and delegated responsibilities • Work records • Standard operating procedures
<p>ASSESSMENT CRITERIA</p>		
<ul style="list-style-type: none"> • Communicating with colleagues and superiors in a manner suitable to the work environment (role play exercise) • Identifies team members and supervisors according to the scope of work • Identifies roles and responsibilities of team members and procedure for working together 	<ul style="list-style-type: none"> • IAC0701 Define and describe the concepts, issues and examples of ethical and unethical conduct • IAC0702 Discuss the impact of these factors on an employer and an employee • IAC0703 Describe the impact of lapses in ethical behaviour on the organisation and individuals in the organisation • IAC0704 Describe the processes which employer organisations use to support ethical conduct in the workplace • Explain the importance of team work 	<p>Supporting Evidence</p> <ul style="list-style-type: none"> • Proof of feedback session with the apprentice reflecting on work ethics and overall professional behaviour at the end of company phase <p>WM-01-WE03 Work as a member of a team</p> <ul style="list-style-type: none"> • Signed-off job cards • Work records • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records

		WM-06-WE02: Participate in and contribute to workplace meetings <ul style="list-style-type: none"> SE0201 Minutes of meetings
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> Internal knowledge test with ethical/communication scenarios and they have to identify correct behaviour and the competency will be at 80% Practical exercise with role play: Interact with team and supervisor – demonstrate professional behaviour, Level of competence required: 80% <p>Learning resources for teaching</p> <ul style="list-style-type: none"> Learning material on defined Knowledge and Practical Skills Modules Role-plays for communication techniques Communication Scenarios/Case studies <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> Personal Protective Equipment: Overalls; Safety Boots; 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>A3</h1>
		Curriculum code: 653303000		
Learning area title: Practice the occupation and behave responsibly and professionally in the workplace	Total hours	SDP	WP	
		120	16	
Work situation title: Manage personal finances (living within one's means, budgeting, saving, dealing with family pressures)	Total hours	8	CC	
Work scenario: Managing one's personal finances can be quite challenging, when starting your first job. Julius has been handed his first salary slip and is now trying to understand how he will manage his personal finances well over the next four years and also how to deal with the family pressures that will be put upon him to assist others.				
Prerequisite learning: None				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p><i>QCTO none</i></p> <p><i>Legislation related to TAX (Personal/ Income/ UIF) – Mock Bank statements and mock salary advice, Calculator</i> <i>Real salary slips of apprentices, if available</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Understand the importance of managing own finances • Understand the difference between income and expenses • Evaluate personal spending and saving habits • Evaluate own debt situation • Draw up a personal monthly budget • Recognise the importance of saving for future goals and contingent costs • Deal with spending pressures resulting from family obligations 	<p><i>QCTO none</i></p> <p>Knowledge of:</p> <ul style="list-style-type: none"> • Personal Monthly Income • Monthly expenses (fixed and flexible) • Indirect expenses (bank charges, interest, etc.) • Types of accounts • Types of saving vehicles • Debt and how to avoid it • Legislation related to Tax • Dealing with spending pressures resulting from family obligations 		<p><i>QCTO none</i></p> <p>The apprentice will be expected to engage in the following work activities:</p> <ul style="list-style-type: none"> • None 	

<ul style="list-style-type: none"> Review own budget at the end of each month (actual spending compared to budgeted spending) 		
ASSESSMENT CRITERIA		
<ul style="list-style-type: none"> Correct explanation of what expenses can be avoided or can be regarded as flexible Own financial plan and explanation of how this plan was drawn up/what was considered Personal monthly budget, based on the wage that apprentices receive 		<p>Supporting Evidence:</p> <ul style="list-style-type: none"> Signed-off Logbook/PoE
<p>Internal Assessment to be performed:</p> <ul style="list-style-type: none"> Practical exercise with drawing up a budget based on mock salary slip and sample expenses. (1 hour testing time) Level of competence required: 80% <p>Learning resources for teaching</p> <ul style="list-style-type: none"> Learning Material on defined Knowledge and Practical Skills Modules Legislation related to TAX (Personal/ Income/ UIF) Mock Bank statements and mock salary advice Calculator, Real salary slips of apprentices if available <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> Personal Protective Equipment: Overalls; Safety Boots; 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>A4</h1>
		Curriculum code: 653303000		
Learning area title: Practice the occupation and behave responsibly and professionally in the workplace	Total hours	SDP	WP	
		120	16	
Work situation title: Plan for work activities and manage time effectively	Total hours	16	CC	
Work scenario: Kwena is working in the maintenance department. When he arrives at work he clocks in and obtains his job card from his supervisor. His job card specifies the tasks he must complete as well as the tools and materials to be used. Kwena reads his job card very carefully so he is clear about what the job requires. He knows that he has to plan his time carefully and work efficiently if he is going to complete everything before the end of the day.				
Prerequisite learning: A1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>QCTO none</p> <p>Read job cards, plan work activities and manage time effectively</p> <p><i>Given samples of jobs cards and timesheets and work scenarios</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Explain the use and importance of job cards and timesheets in the work context • Fill in sample job cards and timesheets as per given work scenario • Identify the most important tasks and develop a plan for prioritisation • Develop a time schedule for the day • Identify potential areas for delay/challenges and how to counter them 	<p>QCTO none</p> <p>Knowledge of:</p> <p>Planning work activities</p> <ul style="list-style-type: none"> • Planning of own daily work activities as per priority schedules • Coordination of work activities within and also across disciplines • Communication channels in the workplace and reporting procedures <p>Job cards and timesheets</p> <ul style="list-style-type: none"> • Job cards and timesheets, their importance and correct uses <p>Time management</p> <ul style="list-style-type: none"> • Effective time management 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>Plan work activities and manage time effectively</p> <ul style="list-style-type: none"> • Plan work activities based on job cards provided • Complete timesheets • Obtain feedback on level of time management perceived by company, including areas for further improvement <p>WM-01-WE03 Work as a member of a team</p> <ul style="list-style-type: none"> • WA0303 Complete work within accepted turnaround times • WA0304 Complete work to accepted standards of quality 	

<ul style="list-style-type: none"> Describe typical time thieves in a common work day 	<ul style="list-style-type: none"> The importance of effective time management (risks to business) How to plan for tasks and manage arising delays/challenges Organisation of self and workspace for peak efficiency Understand the importance of, and the most useful techniques for, setting and achieving goals. Identification of the right things to focus work activities on and how to develop plans for prioritisation Identification of typical time thieves Correlation between stress, ownership and time management 	<p>WM-03-WE01: Plan and execute maintenance work within accepted turnaround times and quality standards</p> <ul style="list-style-type: none"> WA0101 Diarise or schedule work activities in accordance with priorities and work targets <p>WM-03-WE02: Communicate on and solve problems related to the execution of maintenance requests</p> <ul style="list-style-type: none"> WA0201 Take responsibility and initiative to solve work related problems within the scope of standard procedures WA0202 Recognise and report trends of re-occurring problems <p>WM-03-WE03: Keep complete and accurate job cards or records</p> <ul style="list-style-type: none"> WA0301 Record job records in prescribed formats WA0302 Keep material and stores records in prescribed formats <p>WM-06-WE02: Participate in and contribute to workplace meetings</p> <ul style="list-style-type: none"> WA0201 Attend at least 4 planning meetings and contribute to planning of and reporting on work activities WA0202 Attend and contribute to at least one meeting where workplace costs are addressed
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		<p>WM-08-WE01: Conduct workshop administration & reporting for one month</p> <ul style="list-style-type: none"> • WA0101 Job card administration and daily workshop reports <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Reporting channels and delegated responsibilities • Work records • Standard operating procedures • Administrative procedures
ASSESSMENT CRITERIA		
<p>Read job cards, plan work activities and manage time effectively</p> <ul style="list-style-type: none"> • Task requirements from job cards correctly identified • Tasks are adequately prioritised and planned • Potential areas for delay/challenges identified and corrective action explained • Job cards and timesheets completed 	<p>Planning work activities</p> <ul style="list-style-type: none"> • Plan and coordinate work activities in accordance with operational sequences. • Liaise with other relevant trade disciplines and departments and coordinate work activities. <p>Job cards and time management</p> <ul style="list-style-type: none"> • The purpose and use of job cards and timesheets explained • Time management techniques relevant to a pipe fitting context are explained • Key time thieves in a pipe fitting context are identified 	<p><i>Supporting Evidence</i></p> <p>WM-01-WE03 Work as a member of a team</p> <ul style="list-style-type: none"> • Work records • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records <p>WM-03-WE01: Plan and execute maintenance work within accepted turnaround times and quality standards</p> <p>WM-03-WE02: Communicate on and solve problems related to the execution of maintenance requests</p> <p>WM-03-WE03: Keep complete and accurate job cards or records</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records

		<p>WM-06-WE02: Participate in and contribute to workplace meetings</p> <ul style="list-style-type: none"> • SE0201 Minutes of meetings <p>WM-07-WE01: Conduct workshop administration and reporting for one month</p> <ul style="list-style-type: none"> • Completed documentation and reports • Job cards completed for work performed • Completed timesheets • Signed off logbook/PoE
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Internal knowledge test with multiple choice question 30 minutes and the competency will be at 80% • Practical exercise to identify task requirements from a sample job card, plan a schedule of activities in order of priority and complete a timesheet <ul style="list-style-type: none"> ○ Standard time of 1 hour ○ Level of competence required: 80% <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material and assessments for defined knowledge and practical modules • Sample job cards and time schedules • Samples of reporting procedures • Videos on planning and time management in a Mechanical fitter environment <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> • Personal Protective Equipment: Overalls; Safety Boots; 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>A5</h1>
		Curriculum code: 653303000		
Learning area title: Practice the occupation and behave responsibly and professionally in the workplace	Total hours	SDP 120	WP 16	
Work situation title: Use personal computer systems incl. standard office software for trade-related tasks and smart devices	Total hours	40	CC	
Work scenario: Marato is requested to operate a computer at his workplace for the everyday tasks of office communication. He does not yet fully know how to operate all applications and requests an introduction. He also wants to know what smart devices are used in the context of a mechanical fitter's daily work.				
Prerequisite learning: A1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p><i>QCTO none</i></p> <p>Perform basic computer operations</p> <p><i>Given a personal computer and document, spreadsheet and communication applications,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Start up and shut down computer and use basic input and output devices • Create, open and save files, folders, documents and emails • Compile simple reports • Compile spreadsheets including basic arithmetic functions • Retrieve, access, read and print documents • Send and receive electronic 	<p><i>QCTO none</i></p> <p>Knowledge of:</p> <p>Information and communication technology at work</p> <ul style="list-style-type: none"> • Computers, software and systems • Telephones, internet and intranet • The use of ICT to support business processes <p><u>Applied Knowledge</u></p> <ul style="list-style-type: none"> • Input and output devices • Features and use of the application functions • Formatting of text, paragraphs and cells • Inserting, moving, copying and deleting text 		<p><i>QCTO none</i></p> <p>The apprentice will be expected to engage in the following work activities under supervision:</p> <ul style="list-style-type: none"> • Conduct an induction to the company's computer system, its main applications and usage related policies 	

communication	<ul style="list-style-type: none">• Basic spreadsheet formulas• Basic ergonomics of computer use• Main types and parts of computers, and basic features of different operating systems• Range and functions of peripheral devices that can be used with a personal computer• Starting and shut-down procedures as well as ejecting/removing external devices• Basic typing techniques and strategies• Navigation and manipulation procedures of the desktop environment within the range of assigned workplace tasks• Organisational requirements for simple document filing conventions• Dangers of computer viruses, malware programs and illegal internet downloads• Appropriate use of internet search engines• User instructions for basic computer and network security software• Types of printing and storage devices• User instructions for printers and storage devices• Basic troubleshooting techniques for printers• Email etiquette and procedures to follow• Procedures for data security and regular backups• Computer shutdown procedure• Smart devices in the Mechanical fitters context of work	
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ASSESSMENT CRITERIA		
<ul style="list-style-type: none"> • Computer and related devices are cared for and used correctly • Document and file names are easily identified in terms of their purpose and content • The application functions are described and used appropriately • Computer files are named consistently and saved in an appropriate way • Reports are produced as required • Spreadsheets are produced as required • Text is checked for spelling and grammar and corrected • Electronic communication is managed and used appropriately 	<ul style="list-style-type: none"> • Define and describe the concepts, tools and equipment related to information and communication technology • Describe and explain, with the aid of sketches where relevant, how organisations use information and communications technology to support business processes • Discuss the impact of these concepts, tools and equipment on the workplace 	<p>Supporting Evidence:</p> <ul style="list-style-type: none"> • Signed off induction session
<p>Internal Assessment to be performed:</p> <ul style="list-style-type: none"> • Practical exercise of 60 min length covering all key functions of the PC • Level of competence required: 80% <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material on defined Knowledge and Practical Skills Modules • Personal Computers with standard office software and access to the internet • Office furniture and equipment • MS Office package (Word, Excel, Powerpoint) • Email application • Access to the internet • Printer, storage, backup software and devices • Antivirus programmes • Data security and backup procedures <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> • Personal Protective Equipment; Overalls; Safety Boots; 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>A6</h1>
		Curriculum code: 653303000		
Learning area title: Practice the occupation and behave responsibly and professionally in the workplace	Total hours	SDP	WP	
		120	16	
Work situation title: Prepare for job search, CV writing and job interviews	Total hours	24	CC	
Work scenario: Thembi is in the final year of her apprenticeship and is becoming increasingly anxious about whether her company will offer her a job on completion of the apprenticeship. She needs to know how she can find and apply for a job, should she not be placed with her company. She also needs to update her CV and practise job interview skills to ensure her success in securing a new job.				
Prerequisite learning: Year 2				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	60%	Knowledge modules (KM)	40%	Work experience modules (WM)
<p><i>QCTO none</i></p> <p><i>Given samples of current job advertisements for mechanical fitters (electronic and print)</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> Research possible career and employment opportunities for mechanical fitters Demonstrate the steps that must be taken in order to search for and apply for a suitable job Revise and update own CV Formulate and submit applications for actual jobs Obtain an overview of applicable salary systems and average payment scale of mechanical fitters upon qualification 		<p><i>QCTO none</i></p> <p>Knowledge of:</p> <ul style="list-style-type: none"> How to source the right job advertisements for qualifying mechanical fitters and apply for a job (including developing a CV, submitting applications and correct dress code and preparation for job interviews) The average salary scales and basis for decisions regarding salary scales Career opportunities and progression paths available for mechanical fitters Interviewing techniques and questions Preparing for an interview (do's and don'ts) Relevant professional associations and their purpose The licensing, certification and registration requirements for mechanical 		<p><i>QCTO none</i></p> <p>he apprentice will be expected to engage in the following work activities:</p> <ul style="list-style-type: none"> Structured discussion with supervisor about employment opportunities within the company

<p><i>Given brochures and information about preparing for an interview as well as access to the internet</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Answer anticipated interview questions • Ask relevant questions in an interview • Dress appropriately for an interview • Demonstrate that he/she has prepared well for an interview (how to arrive on time; behave professionally; knows something about the company he/she applied with) <p><i>Given access to the internet</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Research whether professional bodies exist for mechanical fitters and explain what the purpose of professional associations are • Explain the need for registration, licensing and certification with professional associations 	<p>fitters</p>	
<p>ASSESSMENT CRITERIA</p>		
<ul style="list-style-type: none"> • Curriculum vitae updated • Applications for carpentry jobs submitted • Successful (winning) roleplays and interview techniques 	<ul style="list-style-type: none"> • Discuss the career opportunities that exist for mechanical fitters. • Lists anticipated interview questions and associated responses to each question • List the professional associations which exist for mechanical fitters • Explain the purpose of professional associations 	<p>Supporting Evidence:</p> <ul style="list-style-type: none"> • Signed logbook/PoE

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| | <ul style="list-style-type: none">• Describe the typical roles and responsibilities of a mechanical fitter | |
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Internal assessment to be performed

- Practical exercise whereby the apprentice updates his/her CV and submits application(s) for a job.
- Competency to be at 100% (CV fully up-to-date and no spelling or grammatical mistakes on the CV or job application letter)

Learning resources for teaching

- Job advertisements for mechanical fitters
- Materials and videos on how to develop a winning CV, write applications, job interview preparation and dress code
- Information from the websites of professional bodies

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>B1</h1>
		Curriculum code: 653303000		
Learning area title: Conduct preparatory and quality assurance activities	Total hours	SDP	WP	
		192	88	
Work situation title: Read, interpret and produce freehand as well as accurate basic 2 and 3 dimensional engineering drawings of mechanical components	Total hours	24	CC	
Work scenario: Manini is requested to view some mechanical drawings. She will need to interpret them for the respective work scenario. She also has to produce a drawing for the machine shop to machine a new shaft for the shaker using a free hand sketching method including symbols and abbreviations and all dimensions.				
Prerequisite learning: A1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-01-PS04 Read, interpret and produce basic engineering drawings <i>Given an engineering drawing and practical drawing assignments</i> The apprentice must be able to:</p> <ul style="list-style-type: none"> PA0401 Identify and interpret symbols, abbreviations and tolerances on engineering drawings PA0402 Identify types of fits PA0403 Identify surface textures PA0404 Draw a free hand sketch PA0405 Draw an isometric and orthographic drawing Housekeeping performed as per industry standard <p><i>Given work scenarios and instructions to produce a freehand sketch/modification of a drawing for an engineering component</i></p> <p>The apprentice must be able to:</p>	<p>Knowledge of:</p> <p>KM-01-KT03 Engineering drawings</p> <ul style="list-style-type: none"> KT0301 Freehand drawing KT0302 Code of practice for engineering drawing (symbols and abbreviations) KT0303 Drawing instruments and equipment KT0304 Dimensioning Methods KT0305 Isometric Drawings KT0306 Assembly and detailed drawings Surface textures tolerances Draw a orthographic projections first and third angle Draw isometric drawing including eclipse/circle 		<p><i>QCTO none</i></p> <p>The apprentice will be expected to gain practical experience and engage in the following work activities under supervision:</p> <ul style="list-style-type: none"> Access, select and view engineering drawings related to a specific work scenario Interpret basic engineering drawings to determine scope of work. Discuss appropriateness/correctness of engineering drawing with supervisor Identify and interpret component requirements Interpret dimensions, instructions, symbols and conventions Extract dimensions from engineering drawings for work to be undertaken Modify drawings by hand where necessary 	

<p>Produce basic sketches and modifications of engineering components</p> <ul style="list-style-type: none"> • Select principal axes and angles • Sketch isometric and non-isometric lines • Construct pictorial circles and arcs • Sketch isometric, oblique and perspective views • Conduct calculations, as required, to ensure correct dimensions and proportions • Construct and use scales for sketch • Apply engineering specific terminology & symbols, & include specifications, as required, to convey required information • Complete border and title blocks and confirm sketch is an accurate representation of component • Check correct application of standard drawing conventions • Obtain verification of completed sketches of basic engineering components by facilitator 	<p>Applied Knowledge</p> <p>PM-01-PS04 Read, interpret and produce basic engineering drawings</p> <ul style="list-style-type: none"> • AK0401 Terms and definitions pertaining to engineering drawings • AK0402 Symbols and abbreviations used in drawings • AK0403 Allowance, tolerances and fits • AK0404 Engineering drawings 	<ul style="list-style-type: none"> • Use drawings to explain and communicate the information content • Draw a freehand sketch of a component
<p>ASSESSMENT CRITERIA</p>		
<p>PM-02-PS04: Read, interpret and produce basic engineering drawings</p> <ul style="list-style-type: none"> • IAC0401 Details and information on engineering drawings are interpreted and explained accurately • IAC0402 Engineering drawings are produced according to specifications • Housekeeping performed as per industry standard 	<ul style="list-style-type: none"> • IAC0101 Freehand drawings demonstrate accurate resemblance to original object in terms of dimensions, shape and size • IAC0102 Accurate drawings indicate instruments are used correctly • IAC0103 First and third angle orthographic projections are read and interpreted accurately • IAC0104 Isometric drawings are read and interpreted accurately 	<p>Supporting Evidence:</p> <ul style="list-style-type: none"> • Signed off logbook/PoE

	<ul style="list-style-type: none"> • IAC0105 Assemblies, sectional drawings and detailed drawings are read and interpreted accurately • Orthographic projections first and third angle according to specifications • Isometric drawing including eclipse/circle 	
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 50 marks (45min) and the competency will be at 80% • Practical exercise of 60min standard time covering all above-mentioned items <ul style="list-style-type: none"> ○ Level of competency of 100% (critical) required for: Accurately resemblance to original object ○ Level of competency of 80% required for: All other components of assessment <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material covering Knowledge and Practical Skills Modules <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> • Personal Protective Equipment; Overalls; Safety Boots; • Engineering drawings and drawing • Measuring instruments include <ul style="list-style-type: none"> ○ Steel ruler ○ Steel square ○ Vernier calliper ○ Micrometer ○ Acrylic Rulers ○ Geometry set squares ○ Reduction scale rulers (Architect's scale) ○ A3 drawing board with small drawing head or double lock mechanism ○ Set of pen and pencil ○ Set square with protractors and scale ruler ○ Compass set with pen adaptor ○ Drafting templates/stencils (architect, lettering, electrician, engineering) 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>B2</h1>
		Curriculum code: 653303000		
Learning area title: Conduct preparatory and quality assurance activities	Total hours	SDP	WP	
		192	88	
Work situation title: Identify, handle and store relevant engineering materials	Total hours	8	8	
Work scenario: Joseph is requested to sort out the workshop store. He has to identify, handle and store relevant engineering (conductive and non-conductive) materials and components. He has to categorise all materials and components. The safety of all present is his responsibility.				
Prerequisite learning: D1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-01-PS05: Identify engineering materials, their characteristics and applications <i>Given different engineering materials:</i> The apprentice must be able to:</p> <ul style="list-style-type: none"> PA010501 Identify the types of engineering materials PA010502 List the characteristics of engineering materials PA010503 List the applications of engineering materials Recall the terms, definitions and use of materials pertaining to the trade Recall the physical properties and characteristics of metal. Identify ferrous and non-ferrous metals. Colour coding of materials 	<p>KM-01-KT04 Engineering materials</p> <ul style="list-style-type: none"> KT0401 Basic metallurgy and heat concepts KT0402 Properties of base metals, alloys and synthetic materials KT0403 Non-ferrous metals and ferrous materials KT0404 Metal specifications and testing Different uses for the materials Safety precautions related to the different materials Safe stacking and storing of mechanical materials Colour coding of materials <p><u>Applied Knowledge</u></p> <ul style="list-style-type: none"> AK010501 Types and applications of engineering materials 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <ul style="list-style-type: none"> Identify relevant engineering materials Handle relevant engineering materials Safely store relevant engineering materials Report on any defects <p>WM-03-WE03: Keep complete and accurate job cards or records</p> <ul style="list-style-type: none"> WA0302 Keep material and stores records in prescribed formats <p>WM-07-WE01: Conduct workshop administration and reporting for one month</p> <ul style="list-style-type: none"> WA0102 Consumable material orders and receipt of goods 	

		<ul style="list-style-type: none"> • WA0103 Participate in stocktaking of the consumable materials store on one occasion <p>WM-07-WE02: Control workshop store for a period of two weeks</p> <ul style="list-style-type: none"> • WA0201 Control the movement of tools • WA0202 Monitor condition of tools • WA0202 Consumable stock movement and levels <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Conditions of employment • Standard operating procedures • Administrative procedures
ASSESSMENT CRITERIA		
<p>PM-01-PS05: Identify engineering materials, their characteristics and applications</p> <ul style="list-style-type: none"> • Different engineering materials are identified and their application explained • Engineering materials are selected for a specific application 	<p>KM-01-KT04 Engineering materials</p> <ul style="list-style-type: none"> • Basic metallurgy and heat concepts are explained • Properties of base metals, alloys, and synthetic materials are described • Metal specifications and testing are discussed • Ferrous and non-ferrous are differentiated and synthetic materials described 	<p>Supporting Evidence</p> <p>WM-03-WE03: Keep complete and accurate job cards or records</p> <ul style="list-style-type: none"> • WA0302 Keep material and stores records in prescribed formats <p>WM-07-WE01: Conduct workshop administration and reporting for one month</p>

		<ul style="list-style-type: none"> • SE0101 Completed documentation and reports <p>WM-07-WE02: Control workshop store for a period of two weeks</p> <ul style="list-style-type: none"> • SE0201 Completed documentation • Signed off logbook/PoE
<p>Internal Assessment to be performed:</p> <ul style="list-style-type: none"> • Internal knowledge test of 20 questions (30 min.) and the competency will be at 80%. • Practical exercise of 30min length covering <ul style="list-style-type: none"> ○ No injury or unsafe act had occurred ○ All materials identified correctly with their advantages and disadvantages stated ○ Level of competence required: 80% <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material on defined Knowledge and Practical Skills Modules • Samples (and charts) of different materials • Hardness tester <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> • Personal Protective Equipment: Overalls; Safety Boots; • Materials: Samples of ferrous and non-ferrous materials: Copper, zinc, galvanised plating, brass, stainless steel, mild steel, cast iron, aluminium, bakelite, nylon, teflon, phosphor bronze, etc. 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>B3</h1>
		Curriculum code: 653303000		
Learning area title: Conduct preparatory and quality assurance activities	Total hours	SDP	WP	
		192	88	
Work situation title: Apply trade calculations in job tasks	Total hours	16	CC	
Work scenario: Xolani must fabricate and install some mechanical components. He studies the drawing and technical specifications for the job carefully to ensure that he understands what to do. He checks some of the calculations of the dimensions and then starts calculating and measuring out the material he will be using.				
Prerequisite learning: B1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p><i>QCTO none</i></p> <p>Perform basic trade calculations</p> <p><i>Given drawings and work scenarios,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Apply calculations and related theoretical principles to determine fabrication parameters • Calculate quantities of materials required for specified job • Use equivalents and conversions tables • Calculate area, volume and circumference • Explain the principle of Pythagorean theorem 	<p><i>QCTO none</i></p> <p>Knowledge of:</p> <ul style="list-style-type: none"> • Basic trade calculations incl.: <ul style="list-style-type: none"> ○ Mathematical calculations, linear measurement, areas, volumes, ratios • Basic calculations for quantities of materials • The use of equivalents and conversion tables • The use of tables of weights and measurements • Ratios and proportions • Calculation of area, volume and circumference • The principle of performing right angle trigonometry • The principle of Pythagorean theorem 		<p><i>QCTO none</i></p> <p>The apprentice will be expected to engage in the following work activities:</p> <ul style="list-style-type: none"> • Calculate relevant production parameters utilising trade calculations for various jobs • Give the apprentices various work scenarios in which he/she needs to measure and calculate: <ul style="list-style-type: none"> ○ Length ○ Area ○ Volume ○ Diameter 	

ASSESSMENT CRITERIA		
<ul style="list-style-type: none"> • Calculations and related theoretical principles are correctly applied to determine fabrication parameters 	<ul style="list-style-type: none"> • Explain and apply the use of equivalents and conversion tables. • Explain and apply the use of tables of weights and measurements • Explain and apply ratios and proportions. • Explain and illustrate the calculation of area, volume and circumference. • Explain and demonstrate the principle of performing right angle trigonometry. • Explain and apply the principle of Pythagorean theorem. 	<p>Supporting Evidence</p> <ul style="list-style-type: none"> • Signed off logbook/PoE
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Internal test, in which mathematical concepts and principles are applied to calculate fabrication and installation requirements. The length will be 1 hour and the competency will be at 80%. <ul style="list-style-type: none"> ○ All calculation steps to be shown ○ Calculations to be correct <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material and assessments for defined knowledge and practical modules • Samples (and charts) of trade calculations and formulas • Different work scenarios for which calculations must be done; <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> • Personal Protective Equipment: Overalls, safety boots, etc. • Scientific Calculator • Zues book/ Engineering black book 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>B4</h1>
		Curriculum code: 653303000		
Learning area title: Conduct preparatory and quality assurance activities	Total hours	SDP	WP	
		192	88	
Work situation title: Understand and apply basic mechanical theory	Total hours	40	CC	
Work scenario: Thandu is requested to attend a basic mechanical class. As a mechanical fitter, he needs an understanding of mechanical theory to the extent that he can apply it in fault finding and repair. He must also master the function of a range of mechanical components and subassemblies.				
Prerequisite learning: B1; D1-D2				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>QCTO none</p> <p><i>Given different mechanical work scenarios, which demonstrate fundamental mechanical principles</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> Determine the different forms of mechanical energy Explain the difference between linear and rotary movement and the applying principles Perform fundamental numerical calculations to solve routine mechanical problems Calculate missing values from a given technical drawing 	<p>Mechanical Theory</p> <ul style="list-style-type: none"> Engineering components, mechanical systems and their working principles The definitions of components and subassemblies The types and functions of components and subassemblies The applications of different components, subassemblies and systems Safety precautions pertaining to mechanical work Numerical calculations for routine mechanical problems Linear and rotary movement Forms of mechanical energy <p>KM-01-KT07: Types and applications of screw threads</p> <ul style="list-style-type: none"> KT0701 Terminology related to screw 		<p>QCTO none</p> <p>The apprentice will be expected to engage in the following work activities under supervision</p> <ul style="list-style-type: none"> None 	

	<p>threads (pitch, root diameter, nominal diameter, lead, flank, internal and external threads, helix angle, included angle)</p> <ul style="list-style-type: none"> • KT0702 Screw threads (v-thread, acme, and square threads) • KT0703 Application of screw threads • KT0704 Thread calculations <p>KM-01-KT08: Types and function of locking devices and fasteners</p> <ul style="list-style-type: none"> • KT0801 Fasteners and locking devices (machine screws, set screws, cap screws, grub screw, studs, locking nuts and bolts, washers, circlips, pins, keys) • KT0802 Application of fasteners and locking devices • KT0803 Drawings of fasteners and locking devices <p>Hoses and fittings</p> <ul style="list-style-type: none"> • Types of hoses • Types of fittings 	
ASSESSMENT CRITERIA		
<p>Display comprehensive understanding of:</p> <ul style="list-style-type: none"> • The different forms of mechanical energy • The difference between linier and rotary movement and the applying principles • Fundamental numerical calculations to solve routine mechanical problems • Calculating missing values from a given technical drawing • Basic trade calculations incl.: 	<p>Mechanical theory</p> <ul style="list-style-type: none"> • Engineering components, mechanical systems and their working principles are identified and explained • The definitions of components and subassemblies are discussed • The types and functions of components and subassemblies are discussed • The applications of different components, 	<p>Supporting Evidence</p> <ul style="list-style-type: none"> • None

<ul style="list-style-type: none"> • Mathematical calculations, linear measurement, areas, volumes, ratios • Basic engineering principles incl.: • Basic physical quantities, concepts, principles, S.I. units, mass, velocity, acceleration, force, weight, density, angles, energy/work/power, moments/torque, centre of gravity, mechanical advantage, levers, etc. 	<p>subassemblies and systems are explained</p> <ul style="list-style-type: none"> • Safety precautions pertaining to mechanical work is explained <p>KM-01-KT07: Types and applications of screw threads</p> <ul style="list-style-type: none"> • Types of screw threads are read and identified • Thread terminology is explained and the profile of a thread is drawn • Freehand drawing of threads are produced with accurate resemblance to original object in terms of dimensions, shape and size • Application of screw threads is discussed • The depth of different threads is calculated <p>KM-01-KT08: Types and function of locking devices and fasteners</p> <ul style="list-style-type: none"> • Types of fasteners and locking devices are identified and discussed • Application of fasteners and locking devices is explained • Fasteners and locking devices are read and interpreted from drawings • Freehand drawings of different types of fasteners and locking devices are produced • Safety precautions pertaining to fasteners and locking devices are explained <p>Hoses and fittings</p> <ul style="list-style-type: none"> • Types of hoses are identified 	
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| | <ul style="list-style-type: none">• Types of fittings are identified | |
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Internal Assessment to be performed

- Internal knowledge test of a minimum of 30 marks (30min) and the competency will be at 80%
- Practical exercise of 45min covering all above-mentioned items
- Level of competency of 80% required for all assessment items

Learning resources for teaching

- Lecture, presentations,
- Applicable videos
- Practical demonstration,
- Practical group work
- Individual practice sessions under supervision
- Print materials, electronic files, software applications incl.:
- Textbooks (Basic Mechanical theory)
- Teaching and learning manuals incl. multimedia applications
- Learning material covering Knowledge and Practical Skills Modules

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots;
- Mechanical components
- Fastener examples
- Types and applications of screw threads
- Thread gauge
- Hoses and fittings
- Vernier
- Micro meter
- Thread file
- Circlip pliers
- Combination pliers
- Set of spanners
- Torque wrench

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>B5</h1>
		Curriculum code: 653303000		
Learning area title: Conduct preparatory and quality assurance activities	Total hours	SDP	WP	
		192	88	
Work situation title: Work to company and industry quality standards	Total hours	24	CC	
Work scenario: Florence is responsible for manufacturing a mechanical component. During and after manufacturing she has to ensure that her work adheres to all relevant quality standards. She uses the relevant standards as well as the specific drawings to check for tolerances and finishing specifications.				
Prerequisite learning: A1, C1, B1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)		Knowledge modules (PM)		Work experience modules (WM)
<p><i>QCTO none</i></p> <p>Interpret legislation and quality assurance specifications <i>Given legislation, work instructions and specifications, and quality assurance directives</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Access relevant legislative and quality assurance documentation • Interpret and adhere to mandatory legislation and quality assurance directives <p>Identify codes and standards applicable to specific work scenarios <i>Given SOPs, standards, SABS handbooks and specifications, technical drawings including tolerances and finishing</i></p>		<p><i>QCTO none</i></p> <p>Knowledge of:</p> <p>Understand quality assurance and control concepts and processes</p> <ul style="list-style-type: none"> • The importance of standards for companies and industry • Standard regulating bodies applicable to the Mechanical Fitter trade in South Africa and internationally • Codes and standards that are applicable to Mechanical Fitters • Tolerances and finishing specifications • Consequences of not adhering to set standards, tolerances and finishing specifications • Instruments and gauges to check quality • Methods of identifying quality assurance standards from technical drawings and 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM-03-WE01 Plan and execute maintenance work within accepted turnaround times and quality standards</p> <ul style="list-style-type: none"> • WA0102 Complete work within accepted turnaround times and quality standards • WA0103 Plan the execution of maintenance requests with production staff to minimise down time or production losses • Identify codes and standards applicable to materials, systems and components and work tasks • Adhere to SOP and quality standards whilst executing work assignments • Explain reasons for necessity of adhering to quality standards and

<p><i>specifications as well as finished work samples</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Identify quality process, standards and requirements in the workplace • Identify appropriate systems of inspection / quality control in given scenarios • Identify applicable codes and standards for given examples / scenarios in respective handbooks • Explain the reasons for the applicable quality codes and standards • Identify instruments and gauges to use to check quality in given examples • Check the samples for adherence to the applicable quality standards • Identify and report on deviations from quality standards in the provided samples • Identify and complete quality assurance documentation for given examples 	<p>other documentation such as SABS handbooks</p> <ul style="list-style-type: none"> • Methods of ensuring adherence to quality standards during and after completion of work • Standard Operating Procedure (SOP) and its importance in ensuring efficiency, quality output and uniformity of performance • Quality assurance documentation in the workplace 	<p>potential negative consequences in case of non-compliance</p> <ul style="list-style-type: none"> • Check completed work for adherence to applicable standards, tolerances and specifications and report back • Propose remedial action in the case of non-compliance <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Conditions of employment • Standard operating procedures
<p>ASSESSMENT CRITERIA</p>		
<p>Examine work samples for conformance to quality standards</p> <ul style="list-style-type: none"> • Applicable quality standards are identified from the respective handbooks and listed in full as well as the reasons therefore explained • Methods for inspecting and testing samples for conformance explained 	<ul style="list-style-type: none"> • Applicable standards and the reasons therefore are adequately explained • Methods for identifying adherence to quality standards are correctly described • Negative consequences of non-conformance are adequately explained 	<p>Supporting Evidence</p> <p>WM-03-WE01 Plan and execute maintenance work within accepted turnaround times and quality standards</p> <ul style="list-style-type: none"> • SE0101 Signed-off job cards • SE0102 Non-conformance reports • SE0103 Workplace logbook or portfolio

<ul style="list-style-type: none"> • Suitable non-destructive examination methods identified for given examples • Given samples examined for deviation from quality standards and deviations are correctly identified • All quality deviations are correctly identified in quality report • Negative consequences of non-compliance are adequately explained 		<ul style="list-style-type: none"> • Signed-off logbook/PoE
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 20 marks (30 min) and the competency will be at 80% • Practical exercise with 2 given work samples, quality standards, drawings (incl. tolerances and finishing specifications) for identification of adherence to quality standards and provision of quality report. <ul style="list-style-type: none"> ○ Standard time of 30min ○ All safety procedures and principles adhered to ○ Level of competence required: 80%. <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material and assessments for defined knowledge and practical modules • Codes and standards applicable to the work (SABS handbooks and others) • Samples, comparison chart and ISO chart • Chart of standard setting bodies • Drawings and specifications which include quality requirements • Charts on non-destructive examination techniques • Standard Operating Procedure and Safe Working Procedure • Audio-visual materials on quality standards and control <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> • Personal Protective Equipment: overalls; safety boots; hard hats, safety glasses, safety gloves, ear protection, etc. • Measuring equipment: equipment for checking tolerances and specifications • Work samples for demonstrating and practising quality control 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>B6</h1>
		Curriculum code: 653303000		
Learning area title: Conduct preparatory and quality assurance activities	Total hours	SDP	WP	
		192	88	
Work situation title: Read and produce computer aided design (CAD) drawings (ELECTIVE)	Total hours	80	80	
Work scenario: Lebo is busy with the new design of parts for the holding furnace. This is drawn on a computer-aided design (CAD) program as it is easier and quicker method for drawing. It is also better to have an electronic version of a drawing as you do not need to start from the beginning if any changes need to be made. Lebo requires all the measurements and previous drawings so that the sketches can be accurate and functional at the end.				
Prerequisite learning: Year 2				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p><i>QCTO none</i></p> <p>Plan for CAD and interpret and produce 2D and 3D drawings</p> <p><i>Given a computer with CAD loaded on it, engineering drawings, drawing specifications, consumables, sample objects and printer that can print CAD drawing</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Plan CAD scale production drawing and prepare the computer environment • Draw at least 20 different drawings with CAD which include different views and all dimensions <ul style="list-style-type: none"> ○ Position elevation outlines in accordance with orthographic and isometric principles 	<p><i>QCTO none</i></p> <p>Knowledge of:</p> <p>Knowledge of CAD principles and drawing standards</p> <ul style="list-style-type: none"> • The importance of computer-aided draughting is understood and explained • Understand the advantages and disadvantages of CAD • The main CAD programmes and their uses • Theory and principles associated with computer-aided draughting are explained in accordance with task specific survey standards • Theory and principles associated with current disk operating systems are explained in accordance with task specific survey standards. 		<p><i>QCTO none</i></p> <p><i>If workplace allows for this exposure:</i></p> <p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>Observe and produce CAD drawings using supervision in the drawing office</p> <ul style="list-style-type: none"> • Read and interpret technical specifications and drawings • Determine the scope of work sequences • Apply fundamental problem solving skills in order to comply with technical design and operational worksite standards • Use CAD to produce basic 2D and 3D drawings under supervision 	

<ul style="list-style-type: none"> ○ Create 2D and 3D objects made up of straight lines ○ Calculate all relevant data such as angles, heights, diameter and circumferences to ensure accuracy at all the times ○ Develop by parallel, radial and triangulation line method using CAD ○ Draw different applicable elevations including sectional views ○ Dimension the drawing according to the principles ● Manage and print drawings <ul style="list-style-type: none"> ○ Create a material list ○ Manage and save the drawing files according to site/company procedures ○ Print CAD drawing: select the size of paper, scale and printer type to meet task and requirements 	<ul style="list-style-type: none"> ● Applicable task specific legal requirements pertaining to draughting standards are understood and explained ● Theory and principles associated with co-ordinate systems are explained in accordance with task specific survey standards ● Principles associated with scales (system set up) and the construction of plans are understood and explained. <p>Planning of work activities</p> <ul style="list-style-type: none"> ● Use different tools to produce engineering drawing ● Identify different parts to construct engineering drawing ● Understand the correct methods to dimension and scaling of the drawing ● Understand a drawing in order to create mental picture <p>Knowledge of 2D and 3D drawings</p> <ul style="list-style-type: none"> ● Develop inter-penetration using 2D method ● Draw sectional views in 2D method ● Draw simple shapes in 3D method ● Understand, draw and apply different methods of showing cutting planes in 3D <p>Knowledge of assembly drawings in 2D and 3D methods</p> <ul style="list-style-type: none"> ● Assemble different parts ● Make a detail drawing from assembly drawing 	
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	<ul style="list-style-type: none"> • Add dimensions, symbols, specifications and abbreviations to assembly drawings • Create a material list <p><u>Applied knowledge</u></p> <ul style="list-style-type: none"> • NQF Level 3 numeracy • Basic computer literacy, including word processing and spreadsheets • Read and obtain information from a plan • Different computer hardware devices and their functions in engineering field • Different software and its use 	
ASSESSMENT CRITERIA		
<p>Plan for CAD</p> <ul style="list-style-type: none"> • CAD scale production drawing planned and computer environment prepared <p>Interpret and produce 2D and 3D drawings</p> <ul style="list-style-type: none"> • Position elevation outlines in accordance with orthographic and isometric principles • Save drawing according to site/company procedures • Select the size of paper, scale and printer type to meet task and requirements <p>Use the computer and other attachments on the computer</p>	<p>Planning of work activities</p> <ul style="list-style-type: none"> • Use different tools to produce engineering drawing • Identify different parts to construct engineering drawing • Understand the advantages and disadvantages of CAD • Understand the correct methods to dimension and scaling of the drawing • Understand a drawing in order to create mental picture <p>Knowledge of 2D and 3D drawings</p> <ul style="list-style-type: none"> • Develop inter-penetration using 2D method • Draw sectional views in 2D method • Draw simple shapes in 3D method • Understand, draw and apply different methods of showing cutting planes in 3D 	<p>Supporting Evidence:</p> <ul style="list-style-type: none"> • Evidence of completed task and necessary documents completed. • Learner training logbook (training centre and workplace)

<ul style="list-style-type: none"> • To create 2D and 3D objects ,made up of straight lines • Calculate all relevant data such as angles, heights, diameter and circumferences to ensure accuracy at all the times • Develop by parallel, radial and triangulation line method using CAD • Draw different applicable elevations including sectional views. • Dimension the drawing according to the principles • Create a material list • Manage the files and print CAD scale drawing 	<p>Knowledge of assembling drawings in 2D and 3D methods</p> <ul style="list-style-type: none"> • Assemble different parts (fittings) to construct the pipe system • Make a detail drawing from assemble drawing • Add dimensions, symbols, specifications and abbreviations to assemble drawings. • Create a material list <p>Knowledge of CAD principles and drawing standards</p> <ul style="list-style-type: none"> • Data are imported, converted and manipulated from external files in accordance with task specific requirements. • Conventional draughting techniques are performed in accordance with specified requirements. • Plotting procedures are performed in accordance with specified requirements. • Complete the draughting process. • Plan is stored in accordance with task specific requirements. • Indexing, cross-referencing, electronic filing, backups. • Reporting requirements are dealt with in accordance task specific requirements. • The importance of completing the work sequence is understood and explained. 	
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Internal Assessment to be performed

- Internal knowledge test on above elements. Minimum length of 2 hours and the competency will be at 80%
- Practical exercise to read and produce a CAD drawing
 - Standard time 2 hours
 - Drawing to be according specifications given
 - Layouts and neatness
 - All necessary information included on drawing
 - Equipment left in required state
 - All safety aspects adhered to according company policies
 - No injury or unsafe act had occurred
 - Level of competence required: 100%

Learning resources for teaching

- Learning material and assessments for defined knowledge and practical modules
- Charts on different CAD programmes and their purposes
- Charts on draughting standards
- Samples of CAD drawings
- Audio visual material on CAD

Tools, Equipment and Materials

- Personal Protective Equipment: overalls, safety boots, bard hats, safety glasses, safety gloves, etc.
- Equipment: a computer that can run CAD software, CAD software, and a printer
- Consumables: printer cartridge, printer paper, etc.

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>C1</h1>
		Curriculum code: 653303000		
Learning area title: Comply with health and safety practices	Total hours	SDP 136	WP 72	
Work situation title: Adhere to OHS and perform risk assessments (incl. toolbox talks) and lock-out and tag out procedures	Total hours	24	24	
Work scenario: Adherence to safe working procedures is of paramount importance to every Mechanical Fitter. Before Thembi has her first day at work she is introduced to all important OHS rules and regulations. She learns how to perform risk assessments, attend and take notes in toolbox talks, and the importance of lock-out and tag out procedures				
Prerequisite learning: A1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
OHS regulations <i>Given applicable site specific OHS policies, procedures, rules and regulations</i> The apprentice must be able to: <ul style="list-style-type: none"> • Demonstrate understanding of National Safety Legislation (OHS Act & Construction Regulations applicable to the working environment. • PA0102 Demonstrate understanding of general workshop safety in compliance with standard worksite practices. • Identify hazards and risks associated with unsafe acts and conditions within the work environment (perform risk assessments) • Identify relevant safety and Personal Protective Equipment (PPE), and describe the correct applications and limitations of each. 	Knowledge of: KM-01-KT02: Workplace health, safety and environmental protection <ul style="list-style-type: none"> • KT0201 General overview of occupational health and safety legislation • KT0202 General workshop safety rules 20 • KT0204 Safety symbols and coding • KT0205 Types of personal protective equipment • KT0206 Hazard identification and risk assessment principles • KT0207 Fundamentals of securing worksites • KT0208 Environmental protection and pollution concepts <ul style="list-style-type: none"> • The importance of toolbox talks and their function in the workplace • Taking basic notes in a toolbox talk and 		The apprentice will be expected to gain practical experience (engage) in the following work activities under supervision: WM-06-WE03 Contribute to maintaining a safe and productive workshop environment <ul style="list-style-type: none"> • WA0301 Perform a hazard inspection and risk assessment of an engineering workshop, report findings and make recommendations • WA0302 Inspect the statutory registers for an engineering workshop, report findings and recommendations <ul style="list-style-type: none"> • Participate in prescribed OHS arrangements in the workplace • Participate in toolbox talks, meetings and informal discussions and take notes • Report on work results in next morning's 	

<p>Read and respond to safety signage <i>Given a range of general, prohibitive, fire safety and exits, warning, mandatory, vehicle and overhead crane signage, etc.</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Identify and describe the purpose of various types of safety signage • Explain the precautions or actions that have to be taken in response to each safety sign • Explain the implications and consequences of not responding correctly to safety signage <p>Participate in toolbox talk and take basic notes</p> <ul style="list-style-type: none"> • Identify and follow correct process for toolbox talk • Seek information and provide responses to others in the group • Take notes and communicate plans/agreed outcomes of toolbox talk <p>Perform basic isolation, lock out and tag out procedures as per applicable industry standards <i>Given different work scenarios, which require lock/tag out for safe working procedure</i></p> <p>The apprentice must be able to</p> <ul style="list-style-type: none"> • Correctly identify all kinds of different energy's (potential, pressure, steam, electrical, gravity, kinetic, mechanical) and how to de-energise them 	<p>how to report back the following day</p> <ul style="list-style-type: none"> • The importance of lock-out and tag out • Industry policy and procedure for lock-out and tag-out • Different forms of energy (potential, pressure, steam, electrical, gravity, kinetic, mechanical) • How to test for ZERO energy • Different forms of tag and lock out procedures and their application as well as associated risks <p><u>Applied Knowledge</u></p> <ul style="list-style-type: none"> • Purpose of warning, mandatory, statutory and informative signs • Workplace safety, health and environmental principles and procedures • Specified requirements pertaining to employers' and employees' duties concerning occupational safety and health • Consequences of not obeying safety signage 	<p>toolbox talk</p> <ul style="list-style-type: none"> • Evaluate safety risks in relation to given work tasks and adopt preventative measures • Perform an OHS evaluation of the workplace and provide a report to mentor/superior on identified risks and potential preventative measures • Secure a work area with the applicable safety signage • Perform basic isolation, lock out and tag out procedures as per applicable industry standards <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Conditions of employment • Standard operating procedures
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<ul style="list-style-type: none"> • Test for ZERO energy • Use different kinds of isolation lockout systems e.g. Gang lock vs. ball valve lock • Perform basic isolation, lock out and tag out procedures as per applicable industry standards 		
ASSESSMENT CRITERIA		
<ul style="list-style-type: none"> • All signs are correctly and immediately recognised and their purpose explained • The correct relevant actions or precautions in response to safety signs are described and explained • The implications and consequences of not responding to safety signage are described • Basic isolation, lock out and tag out procedures are performed as per applicable industry standards 	<ul style="list-style-type: none"> • Described and explained general safe work practices correctly • Safety signs are recognised and described in terms of associated risk and safe conduct • The inter-relationship between workplace safety and a productive work environment is demonstrated through responses to questions • Environmental regulations concerning disposal of hazardous wastes are described 	<p>Supporting Evidence:</p> <ul style="list-style-type: none"> • SE0301 Reports and recommendations • Proof of toolbox talks • OHS evaluation of the workplace and issued report to mentor/superior
<p>Internal Assessment to be performed:</p> <ul style="list-style-type: none"> • Internal knowledge test with multiple choice question 30 minutes and the competency will be at 80% • Practical observation in which apprentice is requested to identify hazards, unsafe acts and conditions, explain safety signage and prescribe remedial action (45 minutes per candidate, can be done at same time), competency at 80% • Level of competency of 100% (critical) required for: lock out and tag procedures <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material covering defined Knowledge and Practical Skills Modules • Different work scenarios which require the assessment of risks in the workplace <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> • Personal Protective Equipment: Overalls; Safety Boots; • Safety signage; Tag out board; Lock; Different lockout mechanisms 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>C2</h1>
		Curriculum code: 653303000		
Learning area title: Comply with health and safety practices	Total hours	SDP	WP	
		136	72	
Work situation title: Perform first aid and fire fighting	Total hours	24	24	
Work scenario: Knowing what to do in case of an accident or a fire cannot be underestimated. Before Thembi has her first day at work she is introduced to all important First aid & Fire fighting principles.				
Prerequisite learning: C1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>QCTO none</p> <p>Perform basic first aid <i>Given basic first aid kits</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> Identify the nature of injuries or medical emergencies Select appropriate treatment or equipment Apply relevant treatments Monitor condition of injured person Report orally and in writing on the nature of the injury, the treatment and the condition of the injured person <p>Perform basic fire fighting <i>Given a range of basic fire-fighting equipment and relevant personal protective equipment</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> Identify various types of fire and assess their context Select appropriate fire-fighting and safety equipment for each type of fire 	<p>Knowledge of:</p> <p>KM-01-KT02 Workplace health, safety and environmental protection</p> <ul style="list-style-type: none"> KT0201 General overview of occupational health and safety legislation KT0202 General workshop safety rules KT0204 Safety symbols and coding KT0205 Types of personal protective equipment KT0206 Hazard identification and risk assessment principles KT0207 Fundamentals of securing worksites KT0208 Environmental protection and pollution concepts Causes, prevention and control of fires Basic first aid Incident reporting Evacuation procedures 		<p>QCTO none</p> <p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <ul style="list-style-type: none"> Exercise fire fighting measures in a mock exercise (if applicable) Be appointed as a temporary first aider and fire fighter at the workplace 	

<ul style="list-style-type: none"> • Contain or extinguish various types of fire • Retreat from fires where required 	<p><u>Applied Knowledge</u></p> <ul style="list-style-type: none"> • Types of injury and medical emergency • Purpose, methods, procedures and techniques of basic first aid • Typical contexts in which injuries occur • Implications of incorrect identification, poor treatment or lack of prioritisation of injuries or medical emergencies • First aid reporting procedures and techniques • Applicable safety, health and environmental legislation and regulations • Role of first aid practitioner in relation to medical or para-medical personnel • Types, purpose and function of fire fighting equipment • Symbols on fire fighting equipment • Characteristics of various types of fire • Fire fighting and retreat methods and procedures • Relevant safety, health and environmental regulations • Fire chemistry, combustion triangle, fire transmission, spread and elimination 	
ASSESSMENT CRITERIA		
<ul style="list-style-type: none"> • The nature of injuries and medical emergencies are identified and prioritised, and appropriate treatment and equipment is selected • Appropriate treatments are applied according to procedures 	<ul style="list-style-type: none"> • Described and explained general safe work practices correctly • Safety signs are recognised and described in terms of associated risk and safe conduct • The inter-relationship between workplace safety and a productive work 	<p>Supporting Evidence:</p> <ul style="list-style-type: none"> • SE01: First aider appointment • SE02: Mock exercise in fire fighting

<ul style="list-style-type: none"> • Condition of the injured person is monitored until appropriate medical personnel arrives • Reporting is concise, accurate and clear • Implications of incorrect identification, poor treatment or lack of prioritisation of injuries or medical emergencies are described and explained • Various types of fire are identified and the context assessed correctly • The correct equipment is selected and used to extinguish or contain each type of fire • The correct procedure is followed to retreat from fires 	<ul style="list-style-type: none"> • Regulations for the prevention and control of fires and the causes, effects and implication of fires are described • The attributes, characteristics, descriptions and properties of different types of fires are explained • Basic first aid procedures are described for the attributes, characteristics and properties of various injuries • The implication of injuries, their causes and effects are explained 	
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Internal Assessment to be performed

- Practical test as per provider requirements on first aid and fire fighting, competency at 80% - critical outcomes 100%.

Learning resources for teaching

- Learning Material on defined Knowledge and Practical Skills Modules
- Basic first aid kits
- A range of basic fire-fighting equipment and relevant personal protective equipment

Tools, Equipment and Materials

- Personal Protective Equipment; Overalls; Safety Boots;

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		C3
		Curriculum code: 653303000		
Learning area title: Comply with health and safety practices	Total hours	SDP	WP	
		136	72	
Work situation title: Work safely and correctly with basic hoisting & lifting equipment (up to 2.5 tons)	Total hours	40	CC	
Work scenario: Manini is requested to fit a 200 mm pipe assembly to a construction. The assembly must be lifted and mounted to complete a section of construction. She has to identify the lifting equipment by considering the mass and diameter of the pipe. She must also inspect the work area for hazards. The safety of her and all present is her responsibility.				
Prerequisite learning: A1, A4, B2, B4, C1, C5, D1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>Identify, use and care for lifting and support equipment <i>Given lifting and support equipment applicable to the trade including lifting and coffin hoists, jib cranes, manual jacks, hydraulic jacks, chain blocks, steel rope and nylon slings, shackles, air hoists, eye bolts, tackle, various kinds of support equipment, cleaning and lubricating materials, task instructions, a range of typical items for lifting and relevant personal protective equipment etc,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> Identify potential hazards and risks related to the use of the lifting and support equipment and list appropriate responses Identify the correct lifting equipment for a variety of lifting tasks and describe their functions 	<p>Knowledge of:</p> <p>KM-01-KT06 Basic lifting concepts</p> <ul style="list-style-type: none"> KT0601 Rigging (slings, block and tackle, chain block, steel ropes) KT0602 Rigging concepts KT0603 Loads selection and limitations KT0604 Safety precautions (incl. correct PPE) <p>Applied Knowledge</p> <ul style="list-style-type: none"> Safety and housekeeping standards related to lifting and support equipment Techniques for using and maintaining lifting and support equipment Safety procedures and legal requirements Safe operating procedures for lifting equipment Manufacturers' procedures and specifications related to lifting and support equipment 		<p><i>QCTO none</i></p> <p>The apprentice will be expected to engage in the following work activities under supervision:</p> <ul style="list-style-type: none"> Select the correct lifting and hoisting equipment for the work task at hand Perform risk assessment on lifting and hoisting task in the respective environment Move equipment/materials (up to 2500kg) as per company specific requirements Inspect equipment and check registers Move equipment/materials on the work site with hoisting and lifting equipment (under various stages of supervision) Store hoisting and lifting equipment, record and report any defects Maintain hoisting and lifting equipment Apply safety and housekeeping standards related to lifting and hoisting 	

<ul style="list-style-type: none"> Describe and explain the requirements and standards for inspecting lifting equipment Identify the correct weight carrying capacity of lifting and support equipment for a variety of tasks Inspect lifting equipment for valid certification, and identify and report defects Select and use a range of different lifting and support equipment for appropriate tasks according to the equipment's size and weight Select and use appropriate personal protective equipment Clean, maintain and store lifting and support equipment after use, and clean the work area 	<ul style="list-style-type: none"> Correct and safe application of lifting and support equipment Typical hazards and risks associated with lifting and support equipment Environmental requirements and practices Criteria and requirements for inspecting and reporting on condition of lifting and support equipment ISO standards for slings, hooks, shackles and eye bolts Storing of lifting and support equipment 	<ul style="list-style-type: none"> Provide work documentation, verbal and written reports as required by the company <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> Workplace Hazard Inspection and Risk Assessment procedures Material request & storage procedures Equipment handling and storage procedures Conditions of employment Standard operating procedures
ASSESSMENT CRITERIA		
<ul style="list-style-type: none"> Items are lifted and, where applicable, supported using the correct lifting and support equipment All potential hazards are identified and appropriate steps, including the use of personal protective equipment, are taken to reduce the risk according to the specific requirements for each task Lifting and support equipment are identified and their functions and relevant safety standards are correctly described and explained 	<ul style="list-style-type: none"> Types of rigging are identified and described Rigging concepts are discussed Loads are calculated and selected Safety precautions pertaining to rigging are explained 	<p>Supporting Evidence</p> <ul style="list-style-type: none"> Signed off PoE/logbook

<ul style="list-style-type: none"> • Lifting and support equipment is examined for damage and all defects are identified and reported • Maximum lifting capacities and limits are observed • Lifting equipment is not damaged during or after use • Lifting equipment work area is cleaned and maintained in accordance with requirements • Lifting and support equipment is stored according to the requirements 		
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Internal knowledge test (30 min) about identification of equipment, maintenance and storage the competency will be at 80%. • Practical exercise identification, inspection and safe lifting techniques <ul style="list-style-type: none"> ○ #Standard time 1 hour ○ Level of competence required: 80% <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material on defined Knowledge and Practical Skills Modules • Practical tasks to move equipment/materials (up to 2500kg) <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> • Personal Protective Equipment; Overalls; Safety Boots; Hard hats, safety glasses, safety gloves, etc. • Lifting and hoisting equipment: Lifting and coffin hoists, manual jacks, hydraulic jacks, chain blocks, steel rope and nylon slings, shackles, eye bolts, tackle, chain slings, tirfor • Electrical motors, gearboxes, pallets to be lifted, any type of load not exceeding 2.5 ton • Cleaning and lubricating materials 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		C4	
		Curriculum code: 653303000			
Learning area title: Comply with health and safety practices		Total hours	SDP		WP
		136	72		
Work situation title: Work safely at heights (incl. ladders & scaffolds) and in confined spaces as well as in & near excavations (if applicable)		Total hours	40	24	
Work scenario: Manini is requested to work in different contexts: At height, in a confined space as well as in/near excavations. Before she performs the actual work, she needs to access the specific risks involved when working in such areas.					
Prerequisite learning: A1, C1					
INTEGRATED LEARNING CONTENT					
Practical skills modules (PM)		Knowledge modules (KM)		Work experience modules (WM)	
<p><i>QCTO none</i></p> <p><i>Given various types of ladders and different work scenarios, which require the use of ladders:</i></p> <p>The apprentice must be able to:</p> <p>Use of Ladders</p> <ul style="list-style-type: none"> Select the correct type of ladder for use according to the specific work requirements Confirm certification of ladder for purpose and identify associated work tasks Ensure area for ladder placement is free of obstructions Place and position ladder on suitable, clean and level surface (top & bottom) Check if ladder is placed at appropriate angle and has the correct height in accordance with given limits (up to 9m) Secure and tie ladders (top or bottom) and/or obtain assistance to prevent slipping, where required 		<p><i>QCTO none</i></p> <p>Working at heights</p> <ul style="list-style-type: none"> Legislative requirements for working at heights. General hazards and risks related to working at heights. Ladder safety Scaffold safety Fall arresting systems and procedures. <p>Working in confined spaces</p> <ul style="list-style-type: none"> General hazards and risks related to working in confined spaces. Adequate ventilation <p>Working in or near excavations</p> <ul style="list-style-type: none"> Working in or near excavations and trenches. Excavation design hazards and safety procedure requirements. 		<p><i>QCTO none</i></p> <p>The apprentice will be expected to engage in the following work activities under supervision:</p> <ul style="list-style-type: none"> Participate in the application and adherence to working at heights procedures whilst performing work at elevated positions. Participate in the application and adherence to working in confined space procedures whilst working in constricted areas. Participate in the application and adherence to working in or near excavations in accordance to worksite standards Carry out risk assessments prior to climbing ladders and select the appropriate PPE for use prior to climbing ladders Select the correct type of ladder for use 	

<ul style="list-style-type: none"> • Safe use of ladders for given work assignment according to OHSA requirements • Observe special safety measures when working close to electrical circuits • Isolate and barricade work area to ensure safe dismantling/taking down of scaffoldings and ladders after work completion • Securely dismantle/take down ladders • Complete ladder register prior to storing • Securely store ladders in designated area <p>Use of Scaffolding (for awareness only)</p> <ul style="list-style-type: none"> • Select the appropriate PPE for use prior for erecting scaffolding • Select the correct type of ladder for use according to the specific work requirements • Select the correct type of scaffolding for use according to the specific work requirements • Check scaffolding for compliance • Reject, and label damaged scaffolding components and initiate repair/replacement process • Erect scaffolding and install components correctly for the stabilisation of the scaffolding up to 2m 	<ul style="list-style-type: none"> • Properties and classification of soil types, sloping requirements, excavation support systems and back filling requirements. <p>Safe use of ladders</p> <ul style="list-style-type: none"> • Types of ladders (e.g. extension ladder, a-frame ladder, wooden ladder, etc.) • Purpose of ladders and where different types are used • Safe erection methods for ladders • Safety precautions concerning ladders (incl. overreach, overload, etc.) • Correct positioning and demarcation of areas before climbing of ladders • Risk assessment methods before climbing ladders • Methods of inspection of ladders (visual and mechanical) • Angles and fastening of ladders when extended • Methods of checking rungs on ladders • Types of Non-skid devices for ladders • Methods of checking the spreader brace devices for ladders • Maximum heights of ladders • Different types of PPE used when climbing ladders • Ladder register (purpose of and completion) • Standard operating procedures with regards to ladders 	<p>according to the specific work requirements</p> <ul style="list-style-type: none"> • Check ladders for compliance and reject non-compliant ladders and initiate repair/replacement process • Use ladders on inside/outside structures for applicable work • Complete ladder register prior to storing of the ladders. • Store ladders in accordance with the manufactures specification or organisational specifications • Erect scaffolding and install components correctly for the stabilisation of the scaffolding to install inside and outside of structures up to 2m • Erect scaffoldings in various work environments and for various work scenarios • Complete scaffolding register prior to storing of scaffold • Store scaffolding in accordance with the manufactures specification or organisational specifications <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Conditions of employment • Standard operating procedures
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	<p>Safe use of scaffolding</p> <ul style="list-style-type: none">• Types of visual inspection of scaffolding• Types of scaffolding• Purpose of scaffolding and where different types are used• The different components used in erecting of scaffolding• Safe methods of erecting scaffolding• Establishment of footings• Safe work methods to determine the bearing capacity of ground or working surfaces• Techniques for using ropes• Types of scaffolding accessories• Lifting devices include cantilevered hoists and gin wheels• Rules and regulations associated with scaffolding• Different types of PPE for use when erecting scaffolding• Purpose and completion of the scaffolding register• Types of platforms for use on scaffolding• Support structures for scaffolding• Permissible alterations and repairs due to work damage, accidents, misuse and other changes• Standard operating procedures with regards to scaffoldings	
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ASSESSMENT CRITERIA

<ul style="list-style-type: none"> • Understanding of National Safety Legislation (OHS Act & Construction Regulations applicable to the working environment is demonstrated. • Application of general workshop safety in accordance with standard worksite practices. • Adherence to working at heights procedures whilst performing work at elevated positions. • Adherence to working in confined space procedures whilst working in constricted areas. • Adherence to working in or near excavations in accordance to worksite standards. • Selecting suitable ladders and scaffolds for loads and the environment in which they are to be erected • Safe erecting/assembling of ladders/scaffolds in different structures • Adequate use of support accessories/equipment • Compliance with legislation and standard operating procedures when using ladders • Correct storage of ladders 	<p>Working at heights</p> <ul style="list-style-type: none"> • Explain conditions/ requirements that compels conformance to work on height procedures. • Identify general hazards and risks related to working at heights. • Explain mandatory requirements with regard to the use of step ladders. • Explain mandatory requirements with regard to the use of scaffolding. <p>Working in confined spaces</p> <ul style="list-style-type: none"> • Explain the definition of a confined space as per relevant legislation. • Explain conditions/ requirements that compels conformance to working in confined spaces. • Explain mandatory requirements and procedures with regard to working in confined spaces. • Identify general hazards and risks related to working in confined spaces. <p>Working in or near excavations</p> <ul style="list-style-type: none"> • Explain the definition of a trench / excavation as per the OHS Act and Construction Regulations. • Explain the hazardous nature of working in and around excavations. • Explain the safety requirements that need to be adhered to when working in or near trenches and excavations. 	<p>Supporting Evidence:</p> <ul style="list-style-type: none"> • Signed off PoE/logbook • Completed ladder and scaffold registers
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	<ul style="list-style-type: none"> • Explain sloping requirements for different types of soil. • Identify and explain the use of shoring materials. • Identify and explain the use of pre-manufactured support systems. • Explain the calculations for the grade and elevation of a trench. • Explain backfilling procedures. 	
<p>Internal Assessment to be performed:</p> <ul style="list-style-type: none"> • Internal knowledge test (30 min) about identification of equipment, maintenance and storage the competency will be at 80%. • Practical exercise identification, inspection and working techniques (ladders, scaffolds), confined spaces & in and near excavations <ul style="list-style-type: none"> ○ #Standard time 2 hours ○ Level of competence required: 100% <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material covering Knowledge and Practical Skills Modules • Practical tasks <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> • Personal Protective Equipment: Overalls; Safety Boots; Safety gloves; Hard hat; Safety jacket • High visibility reflective vest with suitable personal identification details • Body harness, anchorage, lifeline • Ropes, chains, fasteners, fixing devices • Spanners/ wrenches; screw drivers; hammers; gin wheels • Shovels • Ladders up to 9 meters • Modular and prefabricated scaffolds up to 2 meters • Steel tubing • Prefabricated scaffolding components • Supporting accessories and equipment (e.g. secured by nylon ropes, wheels, chains, couplings etc.) • Transport trolleys 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>C5</h1>	
		Curriculum code: 653303000			
Learning area title: Comply with health and safety practices		Total hours	SDP		WP
			136		72
Work situation title: Perform housekeeping and resource efficient and environmentally friendly waste removal (incl. storage of hazardous materials)		Total hours	8	CC	
Work scenario: Tom has completed his drilling task on the pedestal drilling machine. He is requested to perform all required housekeeping tasks as per industry standards and dispose of all waste materials in environmentally friendly manner. This includes handling and storing all hazardous material safely.					
Prerequisite learning: A1, B2, C1, D1					
INTEGRATED LEARNING CONTENT					
Practical skills modules (PM)	Knowledge modules (KM)	Work experience modules (WM)			
<p>QCTO none</p> <p>Perform housekeeping activities as per industry standards <i>Given an untidy workshop after a full day of work</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> Identify all areas required to clean in order to perform housekeeping as per industry standard Clean all relevant areas as per prescribed standard Collect tools, review tools for any defects Clean and store all tools appropriately Collect all waste materials and store OR dispose of in an environmentally friendly manner <p>Handling and storage of hazardous materials</p>	<p>Knowledge of:</p> <p>KM-01-KT02 Workplace health, safety and environmental protection</p> <ul style="list-style-type: none"> KT0201 General overview of occupational health and safety legislation KT0202 General workshop safety rules KT0204 Safety symbols and coding KT0205 Types of personal protective equipment KT0206 Hazard identification and risk assessment principles KT0207 Fundamentals of securing worksites KT0208 Environmental protection and pollution concepts <p>Housekeeping</p> <ul style="list-style-type: none"> The importance of housekeeping and reasons therefore – also related to OHS 	<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM-06-WE04 Contribute to minimising waste and controlling costs</p> <ul style="list-style-type: none"> WA0401 Inspect the waste handling practices of an engineering workshop, report findings and make recommendations WA0402 Assume responsibility for the consumable store area for a minimum of two weeks, report on stock control practices and formulate recommendations <ul style="list-style-type: none"> Perform regular housekeeping activities and receive feedback on standards performed 			

<p><i>Given various types of hazardous materials and work scenarios, which require the handling and storage thereof</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Select and use correct PPE • Identify hazardous materials and explain their respective risks • Lift, carry and handle hazardous substances in a safe manner • Safely store the substances 	<ul style="list-style-type: none"> • Safety and housekeeping standards applicable to the specific industry • Techniques for inspecting, cleaning and storing tools • Correct handling, storage and disposal of common waste materials applicable to the industry <p>Hazardous materials</p> <ul style="list-style-type: none"> • Select and use correct PPE • Hazardous materials and their respective risks to health and the environment • Safe handling and storage of hazardous materials • The impact of incorrectly disposing of waste • Environmental regulations for the disposal of relevant hazardous waste • Interpretation of Material Safety Data Sheets (MSDS) <p><u>Applied Knowledge</u></p> <ul style="list-style-type: none"> • Safety and housekeeping standards related to the industry • Techniques for inspecting, cleaning and storing tools • Environmentally friendly waste material disposal • Handling, storage and disposal of hazardous materials 	<ul style="list-style-type: none"> • Conduct toolbox checks, clean tools and safely store as per industry standard • Select and use correct PPE • Lift, carry and handle hazardous substances • Store hazardous substances following safety procedures <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Conditions of employment • Standard operating procedures
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ASSESSMENT CRITERIA		
<ul style="list-style-type: none"> • Housekeeping procedures are performed to industry standard • Tools are inspected, cleaned and stored as per prescribed standard • Waste materials are either stored or disposed of in environmentally friendly manner • Material Safety Data sheets are correctly interpreted • Hazardous substances are lifted, carried stored following the applicable safety procedures 	<p>Housekeeping</p> <ul style="list-style-type: none"> • Selection and use correct PPE is explained • Correct housekeeping procedures are identified and the reasons for them explained • Techniques for inspecting, cleaning and storing of tools are adequately described • The types of hazardous waste are identified and the impact of incorrectly disposing of waste is described • Environmental regulations for the disposal of relevant hazardous waste are correctly explained • Material Safety Data sheets are correctly interpreted 	<p>Supporting Evidence:</p> <p>WM-06-WE04 Contribute to minimising waste and controlling costs</p> <ul style="list-style-type: none"> • SE0401 Reports and recommendations • Signed off PoE/Logbook
<p>Internal Assessment to be performed:</p> <ul style="list-style-type: none"> • Internal knowledge test (30 min) with various housekeeping scenarios. Apprentice to identify and explain correct housekeeping procedures and propose remedial action for inappropriate housekeeping measures. Competency must be at 80%. • Practical exercise of performing regular housekeeping activities and safely handling and storing hazardous materials <ul style="list-style-type: none"> ○ #Standard time 1 hour ○ Level of competence required: 80%, hazardous materials: 100% <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material covering Knowledge Modules • Practical tasks <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> • Personal Protective Equipment; Overalls; Safety Boots; Hard hats, safety glasses, safety gloves, etc. • Hazardous Materials for storage (oils, thinners, paints, safety solvents, acids) • Material Safety Data Sheets (MSDS) for respective materials 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>D1</h1>
		Curriculum code: 653303000		
Learning area title: Select, care for and use hand tools, power tools and machinery	Total hours	SDP	WP	
		56	48	
Work situation title: Handle and care for basic hand tools	Total hours	16	16	
Work scenario: Morris is requested to identify the hand tools in a Mechanical Fitter toolbox. She must explain the use and care of each item as well as describe the possible hazards. The safety of her and all present is her responsibility.				
Prerequisite learning: A1, B1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-01-PS02 Select and care for engineering hand tools <i>Given an assignment to select specific tools for specific applications and range of hand tools</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA0201 Identify and select the different tools required PA0202 Demonstrate the use the different tools PA0203 Demonstrate cleaning and storing practices of different tools PA0204 Identify potential hazards and risks related to the use of the tools and list appropriate response <p><i>Given tools as reflected in complete Mechanical Fitter Toolbox, pictures of badly and correctly maintained hand tools, real examples of defective hand tools</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> Identify tools and their correct use 	<p>Knowledge of:</p> <p>KM-01-KT05 Engineering tools and equipment</p> <ul style="list-style-type: none"> KT0501 Hand tools to hold, assemble or disassemble components KT0502 Hand-held cutting tools (saws, blades, files, scrapers, chisels, taps and dies, hand reamers, hand broaching tools, hammers centre punch) Standard Mechanical Fitter's tools and their correct use OHS risks related to the use of the tools Specific dangers involved in use of power tools i.e. grinder Regular care and maintenance of basic hand- and power tools Common wear and tear and defects on hand tools Correct repair of faulty hand tools OHS risks associated with maintenance and repair of hand tools 		<p><i>QCTO none</i></p> <p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <ul style="list-style-type: none"> Be assigned to assist with toolbox checks, the care and maintenance of available hand tools Care for own toolbox and tools Assist with the use of hand tools on basic work tasks Perform housekeeping duties <p>WM-07-WE02: Control workshop store for a period of two weeks</p> <ul style="list-style-type: none"> WA0201 Control the movement of tools WA0202 Monitor condition of tools <p>Contextualised Workplace Knowledge</p> <ul style="list-style-type: none"> Workplace Hazard Inspection and Risk Assessment procedures Material request & storage procedures Equipment handling and storage procedures 	

<ul style="list-style-type: none"> • Identify OHS risks associated with the use of hand tools • Identify correct care and storage of supplied hand tools • Plan and prepare for repairs to hand tools: • Identify the correct method of correcting defects noted on examples and effect small common repairs • Perform basic applications of the majority of hand tools for the apprentice to experience their correct use and handling • Apprentice to give a step-by-step list how he/she would go about affecting the repairs needed on the illustrated examples of broken hand tools supplied • Perform Housekeeping as per required industry standards 	<p><u>Applied Knowledge</u></p> <ul style="list-style-type: none"> • AK0201 Identification, function, use and care of hand tools • AK0106 Practices related to quality, health, safety, and protection of the environment when using hand tools 	<ul style="list-style-type: none"> • Conditions of employment • Standard operating procedures • Administrative procedures
ASSESSMENT CRITERIA		
<p>PM-01-PS02 Select and care for engineering hand tools</p> <ul style="list-style-type: none"> • Hand tools are identified and selected for a specific application • The safe and proposer use of hand tools are demonstrated • Hand tools are cleaned and stored correctly 	<p>KM-01-KT05 Engineering tools and equipment</p> <ul style="list-style-type: none"> • Different tools (hand, cutting, measuring, marking off) are listed and identified • Safe care, correct use and storage of tools and equipment are explained • Use of tools demonstrates correct selection for the work at hand • Speeds, feeds and cutting tools are described correctly • Safety precautions pertaining to tools are explained 	<p>Supporting Evidence</p> <p>WM-07-WE02: Control workshop store for a period of two weeks</p> <ul style="list-style-type: none"> • SE0201 Completed documentation • Signed off PoE/logbook

Internal Assessment to be performed

- Internal knowledge test of 45 minutes and the competency will be at 100%
- Practical exercise of provided step-by-step list how he/she would go about affecting the repairs needed on the illustrated examples of broken hand tools supplied

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Pictures of badly and correctly maintained hand tools,
- Real examples of defective hand tools

Tools, Equipment and Materials

- Personal Protective Equipment; Overalls; Safety Boots
- Mechanical Fitter standard toolbox (see list supplied by NAMB)

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>D2</h1>				
		Curriculum code: 653303000						
Learning area title: Select, care for and use hand tools, power tools and machinery		Total hours	<table border="1"> <tr> <td>SDP</td> <td>WP</td> </tr> <tr> <td>56</td> <td>48</td> </tr> </table>		SDP	WP	56	48
SDP	WP							
56	48							
Work situation title: Select and care for engineering power tools (portable and fixed)		Total hours	<table border="1"> <tr> <td>16</td> <td>16</td> </tr> </table>	16	16			
16	16							
Work scenario: Morris is requested to identify the portable and fixed power tools relevant to the Mechanical Fitter trade. She must explain the use and care of each item as well as describe the possible hazards. The safety of her and all present is her responsibility.								
Prerequisite learning: A1, C1, D1								
INTEGRATED LEARNING CONTENT								
Practical skills modules (PM)	Knowledge modules (KM)	Work experience modules (WM)						
<p>PM-02-PS01 Select and care for engineering power tools <i>Given an assignment to select specific power tools for specific applications and a range of power tools and equipment</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA0101 Identify and select the different power tools PA0102 Demonstrate the start-up and shut down procedures of different tools PA0103 Demonstrate cleaning procedures and storage of different tools PA0104 Identify potential hazards and risks related to the use of the tools and list appropriate response <p>PM-02-PS02 Select and care for engineering machines <i>Given a range of practical assignments and fixed machines including pedestal drills, pedestal grinder, power saw, band saw</i></p>	<p>Knowledge of:</p> <p>KM-01-KT05 Engineering tools and equipment</p> <ul style="list-style-type: none"> KT0503 Hand-held power tools (angle grinder, drills, drill bits and reamers) Standard Mechanical Fitter's tools and their correct use OHS risks related to the use of the tools Specific dangers involved in use of power tools i.e. grinder Regular care and maintenance of power tools Common wear and tear and defects on powertools Correct repair of faulty powertools How to correctly replace electrical cords and the legal limitations of what is allowed OHS risks associated with maintenance and repair of hand- and power tools 	<p><i>QCTO none</i></p> <p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <ul style="list-style-type: none"> Be assigned to assist with toolbox checks, the care and maintenance of available power tools Care for own toolbox and tools Assist with the use of power tools on basic work tasks Perform housekeeping activities <p>WM-07-WE02: Control workshop store for a period of two weeks</p> <ul style="list-style-type: none"> WA0201 Control the movement of tools WA0202 Monitor condition of tools <p>Contextualised Workplace Knowledge</p> <ul style="list-style-type: none"> Workplace Hazard Inspection and Risk Assessment procedures Material request & storage procedures 						

<p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0201 Identify and select the different machines • PA0202 Demonstrate start-up and shut down procedures of the different machines • PA0203 Demonstrate cleaning procedures the different machines • PA0204 Identify potential hazards and risks related to the use of the machines and list appropriate response <p><i>Given tools as reflected in complete Mechanical Fitter Toolbox, pictures of badly and correctly maintained power tools, real examples of defective power tools</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Identify tools and their correct use • Identify OHS risks associated with the use power tools • Identify correct care & storage of tools • Plan & prepare for repairs to power tools • Identify the correct method of correcting defects noted on examples. Small repairs to power tools (e.g. change the plug or extension cord, covers, etc.) • Perform basic applications of the majority of power tools for the apprentice to experience their correct use and handling • Apprentice to give a step-by-step list how he/she would go about affecting the repairs needed on the illustrated examples of broken power tools supplied 	<p><u>Applied Knowledge</u></p> <p>PM-02-PS01 Select and care for engineering power tools</p> <ul style="list-style-type: none"> • AK0101 Identification, function, use and care of power tools • AK0106 Practices related to quality, health, safety, and protection of the environment when using power tools <p>PM-02-PS02 Select and care for engineering machines</p> <ul style="list-style-type: none"> • AK0201 Identification, function, use and care of engineering machines • AK0202 Practices related to quality, health, safety, and protection of the environment when using engineering machines 	<ul style="list-style-type: none"> • Equipment handling and storage procedures • Conditions of employment • Standard operating procedures • Administrative procedures
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ASSESSMENT CRITERIA		
<p>PM-02-PS01 Select and care for engineering power tools</p> <ul style="list-style-type: none"> • Power tools and equipment are identified and selected accurately • Power tools and equipment are started and shut down safely and correctly • Power tools and equipment are cleaned and stored correctly <p>PM-02-PS02 Select and care for engineering machines</p> <ul style="list-style-type: none"> • Fixed machines are identified and selected for specified applications • Fixed machines & used safely & correctly • Fixed machines are locked out and cleaned correctly 	<p>KM-01-KT05 Engineering tools and equipment</p> <ul style="list-style-type: none"> • Different tools (hand, cutting, power, measuring, marking off) are listed and identified • Safe care, correct use and storage of tools and equipment are explained • Use of tools demonstrates correct selection for the work at hand • Safety precautions pertaining to tools are explained 	<p>Supporting Evidence:</p> <p>WM-07-WE02: Control workshop store for a period of two weeks</p> <ul style="list-style-type: none"> • SE0201 Completed documentation • Signed off logbook
<p>Internal Assessment to be performed:</p> <ul style="list-style-type: none"> • Internal knowledge test of 45 minutes and the competency will be at 100% • Practical exercise of provided step-by-step list how apprentice would go about affecting the repairs needed on the illustrated examples of broken power tools supplied <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material on defined Knowledge and Practical Skills Modules • Pictures of badly and correctly maintained power tools, • Real examples of defective power tools <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> • Personal Protective Equipment: Overalls; Safety Boots • Portable and fixed power tools standard to a Mechanical Fitter (see list supplied by NAMB) • Portable power tools: Hand drill, angle grinder; Fixed power tools: Pedestal grinder, pedestal drill, power saw 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>D3</h1>
		Curriculum code: 653303000		
Learning area title: Select, care for and use hand tools, power tools and machinery	Total hours	SDP	WP	
		56	48	
Work situation title: Identify, care and use marking and mechanical measuring equipment	Total hours	24	16	
Work scenario: Mpho is requested to identify, care and use mechanical marking and measuring instruments. The safety of her and all present is her responsibility.				
Prerequisite learning: A1, C1, D1-D2				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
PM-01-PS03 Select and care for engineering measuring instruments <i>Given an assignment to select specific measuring tools for specific applications and a range of measuring instruments</i> The apprentice must be able to: <ul style="list-style-type: none"> • PA0301 Identify and select the different measuring instruments • PA0302 Demonstrate the use the different measuring instruments • PA0303 Clean and store the measuring instruments • PA0304 Check and calibrate measuring instruments • PA0305 Identify potential hazards and risks related to the use of the measuring instruments and list appropriate response • Practice reading measuring equipment • Demonstrate calibration 	KM-01-KT05 Engineering tools and equipment <ul style="list-style-type: none"> • KT0504 Measurement tools and equipment (basic measurement tools, precision measuring tools, angular measuring tools, inspection gauges) • KT0505 Marking-off tools and equipment (punches, scribes, combination sets, protractors, callipers (inside and outside), jenny calliper, engineering square, angle plates, marking-off table, dividers) • Scrapers for cleaning surfaces • Calculations of different measuring units • Thread gauge metric and imperial • Radius gauge • Surface comparison chart/gauge • Measuring instruments used in a Mechanical Fitter setting, their use and care 		QCTO none The apprentice will be expected to gain practical experience (engage) in the following work activities: <ul style="list-style-type: none"> • Indicate the range and type of measuring the instruments are designed for • Perform a variety of tasks using measuring and marking off instruments • Maintain and care for measuring and marking off instruments • Report on any defects and store them safely and correctly • Perform housekeeping duties WM-07-WE02: Control workshop store for a period of two weeks <ul style="list-style-type: none"> • WA0201 Control the movement of tools • WA0202 Monitor condition of tools 	

<ul style="list-style-type: none"> • Perform Housekeeping as per required industry standards <p><i>Given a range of work scenarios which require measuring and marking off, instruments listed the necessary engineering tools and equipment applicable to the scenarios, the apprentice must be able to:</i></p> <ul style="list-style-type: none"> • Identify the correct marking off equipment • Measure correctly as per work instruction • State the purpose, use and care for the Tool or equipment <p><i>Given various shapes (flanges, Mechanical Fitter block) on various materials (steel, perspex, paper, galvanised plate)</i></p> <ul style="list-style-type: none"> • Identify the correct marking off equipment • State the purpose, use and care for the respective tools 	<ul style="list-style-type: none"> • Mechanical marking instruments, their use and care • Precautions when marking off and marking off techniques • Precautions when measuring and correct application of measuring instruments <p><u>Applied Knowledge</u> PM-01-PS03 Select and care for engineering measuring instruments</p> <ul style="list-style-type: none"> • AK010301 Identification, reading, calibration, use of and care for measuring instruments • AK010302 Safety and procedures • AK010303 Procedures for cleaning and storing different measuring instruments 	<p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Conditions of employment • Standard operating procedures • Administrative procedures
ASSESSMENT CRITERIA		
<p>PM-01-PS03 Select and care for engineering measuring instruments</p> <ul style="list-style-type: none"> • Measuring instruments are identified and selected for a specific application • Measuring instruments are used and read correctly • Measuring instruments are cleaned and stored correctly • Measuring instruments are checked for accuracy and calibrated correctly 	<p>KM-01-KT05 Engineering tools and equipment</p> <ul style="list-style-type: none"> • Different tools (measuring, marking off) are listed and identified • Safe care, correct use and storage of tools and equipment are explained • Use of tools demonstrates correct selection for the work at hand • Measurement calculations are performed correctly and accurately 	<p>Supporting Evidence</p> <p>WM-07-WE02: Control workshop store for a period of two weeks</p> <ul style="list-style-type: none"> • SE0201 Completed documentation • Signed off PoE/logbook

	<ul style="list-style-type: none"> • Measurements from measuring tools are read and interpreted correctly • Safety precautions pertaining to tools are explained 	
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Constant evaluation throughout in terms of appropriate use • Practical final exercise with set up jigs to demonstrate measuring with different measuring instruments and marking off <ul style="list-style-type: none"> ○ #Standard time 2 hours ○ Level of competence required: 80% <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material as per defined Knowledge and Practical Skills Modules <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> • Personal Protective Equipment; Overalls; Safety Boots; • Mechanical Fitter standard toolbox for each apprentice • Measuring equipment: Tape measure, steel ruler, manual vernier, vernier height gauge, telescopic gauges, inside and outside calipers, inside and outside micrometres (non electronic), depth micrometer (on electronic), line of cord, combination square, engineering square, thread gauge, taper gauge, feeler gauge • Marking off equipment: Scribes, prick punch, centre punch, dividers, jenny caliper, • Mark off table • Materials: Marking blue and steel plate 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		E1
		Curriculum code: 653303000		
Learning area title: Fabricate a range of simple mechanical components and work pieces	Total hours	SDP	WP	
		160	120	
Work situation title: Mark-off, saw and file various simple components and materials	Total hours	72	40	
Work scenario: Happiness is requested to mark off a work-piece that must be welded to a pipe that is designed as part of a construction. She has to identify the material by referring to a drawing and considering the size and tensile strength. She must select the tools and inspect the work area. She then has to measure, saw and mark off the material to specification. The safety of all present is her responsibility.				
Prerequisite learning: D1, D3				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-01-PS01: Plan and prepare for fabrication of components <i>Given practical assignments on fabrication of a range of components, drawings, applicable charts, a list of tools, materials and equipment</i></p> <p>The apprentice must be able to: List the quality criteria required</p> <ul style="list-style-type: none"> List component specifications including tolerances and sizes from the assignment List material, tool and equipment requirements Describe the sequence of work to fabricate the different components Identify and list potential hazards and risks related to the assignments 	<p>Knowledge of:</p> <p>KM-01-KT05: Engineering tools and equipment</p> <ul style="list-style-type: none"> KT0501 Hand tools to hold, assemble or disassemble components KT0502 Hand-held cutting tools (saws, blades, files, scrapers, chisels, taps and dies, hand reamers, hand broaching tools, hammers centre punch) KT0503 Hand-held power tools (angle grinder, drills, drill bits and reamers) KT0504 Measurement tools and equipment (basic measurement tools, precision measuring tools, angular measuring tools, inspection gauges) KT0505 Marking-off tools and equipment (punches, scribes, combination sets, 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM-01-WE01: Fabricate a variety of simple components using basic hand skills and tools</p> <ul style="list-style-type: none"> WA0101 Mark-off and fabricate a minimum of two flanges to given specifications WA0102 Mark-off, cut and fit a minimum of two gaskets to specifications using different materials WA0103 Mark-off, cut and fit a minimum of two spacers/shims to specifications WA0104 Saw and file a minimum of two work pieces to specifications 	

<p>PM-01-PS06: Mark-off various simple components <i>Given engineering drawings, hand tools, measuring instruments, and materials</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0601 Mark-off a work piece • PA0602 Check measurements and marking-off for accuracy • PA0604 Demonstrate adherence to safe and environmentally responsible practices during all the stages of the assignment <p>PM-01-PS08: File work a piece <i>Given work piece specifications, a range of materials and hand tools</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0801 List the quality criteria and specifications required • PA0802 Select the material, tools and equipment required for the assignment • PA0803 Describe the sequence of work to file the work piece • PA0804 Identify and list potential hazards and risks related to the assignments • PA0805 Mark-off the work piece • PA0806 Cut material to size with a hacksaw • PA0807 File the work piece • PA0808 Debur and finish off the work piece • PA0809 Demonstrate adherence to safe and environmentally responsible 	<p>protractors, callipers (inside and outside), jenny calliper, engineering square, angle plates, marking-off table, dividers)</p> <p><u>Applied Knowledge</u></p> <p>Plan and prepare for fabrication of components</p> <ul style="list-style-type: none"> • Procedures to plan and prepare for fabrication of components • Material identification, types and profiles • Practices related to quality, health, safety, and protection of the environment <p>PM-01-PS06: Mark-off various simple components</p> <ul style="list-style-type: none"> • AK0601 Identification, function, use and care of hand tools • AK0602 Identification, reading, calibration, use of and care for measuring equipment or instruments • AK0603 Terms and definitions of engineering drawings • AK0604 Symbols and abbreviations used in drawings • AK0605 Allowance, tolerances and fits • AK0606 Material Identification, types and profiles • AK0607 Types and applications of engineering materials • AK0608 Procedures and techniques/methods for marking-off • AK0609 Practices related to quality, health, safety, and protection of the environment when marking off 	<p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Conditions of employment • Standard operating procedures
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<p>practices during all the stages of the assignment</p> <p>PM-01-PS09: Saw work piece <i>Given work piece specifications, a range of materials and hand tools</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0901 List the quality criteria and specifications required • PA0902 Select the material, tools and equipment required for the assignment • PA0903 Describe the sequence of work to saw the work piece • PA0904 Identify and list potential hazards and risks related to the assignments • PA0905 Mark-off work piece • PA0906 Saw the work piece with a hacksaw • PA0907 Debur and finish off the work piece • PA0908 Demonstrate adherence to safe and environmentally responsible practices during all the stages of the assignment 	<p>components</p> <p>PM-01-PS08: File work a piece</p> <ul style="list-style-type: none"> • AK0801 Procedures to plan and prepare for filing of components • AK0802 Identification, function, use of and care for hand tools used in cutting and filing • AK0803 Identification, reading, calibration, use and care of measuring equipment/instruments • AK0804 Allowance, tolerances and fits • AK0805 Types and applications of engineering materials • AK0806 Procedures to file work pieces • AK0807 Practices related to quality, health, safety, and protection of the environment when filing work pieces <p>PM-01-PS09: Saw work piece</p> <ul style="list-style-type: none"> • AK0901 Procedures to plan and prepare for sawing of components • AK0902 Identification, function, use of and care for hand tools • AK0903 Identification, reading, calibration, use and care of measuring equipment/instruments • AK0904 Allowance, tolerances and fits • AK0905 Types and applications of engineering materials • AK0906 Procedures to saw work pieces • AK0907 Practices related to quality, health, safety, and protection of the environment when sawing work pieces 	
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ASSESSMENT CRITERIA

PM-01-PS01: Plan and prepare for fabrication of components

- The fabrication of the components is planned according to accepted sequences
- Specifications and quality criteria that must be met are clearly linked to the specific instruction
- Tools, equipment and materials required are identified correctly
- Risks and hazards are correctly identified and listed
- Consequences of mistakes in the planning and preparation of the manufacturing task are described correctly

PM-01-PS06: Mark-off various simple components

- The importance of accurate marking-off is explained
- Work piece marked off accurately

PM-01-PS08: File work a piece

- Different hand tools required for filing a work piece are identified and used
- Work piece marked-off
- Work pieces are cut to specific size specifications
- Work pieces are filed correctly to specifications
- Safety and environmental protection practice are adhered to

- Different tools (hand, cutting, power, measuring, marking off) are listed and identified
- Safe care, correct use and storage of tools and equipment are explained
- Use of tools demonstrates correct selection for the work at hand
- Measurement calculations are performed correctly and accurately
- Measurements from measuring tools are read and interpreted correctly
- Speeds, feeds and cutting tools are described correctly
- Safety precautions pertaining to tools are explained

Supporting Evidence:

- SE0101 Signed-off job cards
- SE0102 Non-conformance reports
- SE0103 Workplace logbook or portfolio
- SE0104 Equipment downtime records

<p>PM-01-PS09: Saw work piece</p> <ul style="list-style-type: none"> • Different hand tools required for sawing a work piece are identified and used • Work pieces are sawed correctly to specifications • Safety and environmental protection practice are adhered to 		
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Constant evaluation throughout entire period • Practical exercise of fabrication <ul style="list-style-type: none"> ○ #Standard time 2 hours ○ #Tolerance: 0.05mm ○ Level of competence required: 80% <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material on defined Knowledge and Practical Skills Modules <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> • Personal Protective Equipment; Overalls; Safety Boots; • Hacksaw, scribe, measuring instruments, files • Materials: Marking blue; 8mmx50mmx100mm mild steel plate 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>E2</h1>
		Curriculum code: 653303000		
Learning area title: Fabricate a range of simple mechanical components and work pieces	Total hours	SDP	WP	
		160	120	
Work situation title: Sharpen drill bits as per application and drill material to specifications using a portable and fixed drilling machine	Total hours	16	24	
Work scenario: Joseph is requested to identify and drill relevant steel to a prescribed design. He also is asked to sharpen drill bits. The safety of all present is his responsibility.				
Prerequisite learning: D2-D3				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-02-PS04: Drill material to specifications using a portable drilling machine <i>Given work piece specifications, material, portable drills, drill bits</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA0401 Plan and prepare to drill holes using a portable drilling machine PA0402 Interpret work piece specifications PA0403 Select, prepare and handle material PA0404 Select and use lubricants/coolants PA0405 Mark-off work piece PA0406 Select, inspect and sharpen drill bits PA0407 Set-up portable drilling machine and work piece 	<p>KM-01-KT05 Engineering tools and equipment</p> <ul style="list-style-type: none"> KT0501 Hand tools to hold, assemble or disassemble components KT0502 Hand-held cutting tools (saws, blades, files, scrapers, chisels, taps and dies, hand reamers, hand broaching tools, hammers centre punch) KT0503 Hand-held power tools (angle grinder, drills, drill bits and reamers) KT0504 Measurement tools and equipment (basic measurement tools, precision measuring tools, angular measuring tools, inspection gauges) KT0505 Marking-off tools and equipment (punches, scribes, combination sets, protractors, callipers (inside and outside), jenny calliper, engineering square, angle plates, marking-off table, dividers) 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM-01-WE02: Fabricate a range of WM-01-WE02: Fabricate a range of mechanical components in an engineering workshop using power tools and equipment</p> <ul style="list-style-type: none"> WA0201 Drill holes in a minimum of two work pieces as per specifications using portable and fixed drilling machines WA0202 Sharpen a minimum of two drill bits using fixed grinding machines WA0203 Sharpen a minimum of two chisels using fixed grinding machines 	

<ul style="list-style-type: none"> • PA0408 Drill and debur holes • PA0409 Clean and store • PA0410 Use a portable drilling machine in a safe and responsible manner <p>PM-02-PS05: Drill material to specifications using a fixed drilling machine <i>Given work piece specifications, material, a fixed drilling machine and tools,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0501 Plan and prepare to drill holes using a fixed drilling machine • PA0502 Identify hazards and risks and use fixed drilling machines in a safe and responsible manner • PA0503 Interpret work piece specifications • PA0504 Select, prepare and handle material • PA0505 Select and use lubricants and coolants • PA0506 Mark-off work piece • PA0507 Select, inspect and sharpen drill bits • PA0508 Set-up fixed drilling machine and work piece • PA0509 Calculate & set speeds & feeds • PA0510 Drill and debur holes • PA0511 Lock out, clean the drill and remove and store all attachments • PA0512 Use a fixed drilling machine in a safe and responsible manner and coolants specifications 	<p><u>Applied Knowledge</u></p> <p>PM-02-PS04: Drill material to specifications using a portable drilling machine</p> <ul style="list-style-type: none"> • AK0401 Identification, function, use of and care for portable drilling machine • AK0402 Procedures to drill holes using a portable drilling machine • AK0403 Methods to sharpen drill bits • AK0404 Drill speeds, lubricants/coolants • AK0405 Practices related to quality, health, safety, and protection of the environment when using a portable drill <p>PM-02-PS05: Drill material to specifications using a fixed drilling machine</p> <ul style="list-style-type: none"> • AK0501 Identification, function, use and care of fixed drilling machines • AK0502 Procedures to drill holes using a fixed drilling machine • AK0503 Methods to sharpen drill and tool bits • AK0504 Drill speeds, lubricants 	<p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Conditions of employment • Standard operating procedures
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ASSESSMENT CRITERIA		
<p>PM-02-PS04: Drill material to specifications using a portable drilling machine</p> <ul style="list-style-type: none"> • The use of portable drilling machines is explained and demonstrated • The work pieces are drilled according to procedures and specifications • Drill bits are sharpened to specifications • Risks and hazards are identified and responded to in a responsible manner • Lubricants and coolants are used according to manufacturer's specifications <p>PM-02-PS05: Drill material to specifications using a fixed drilling machine</p> <ul style="list-style-type: none"> • The use of fixed drilling machines is explained and demonstrated • The work piece is drilled according to procedure and specifications • Drill bits are sharpened to specifications • Risks and hazards are identified and responded to in a responsible manner • Lubricants and coolants are used according to manufacturer's 	<ul style="list-style-type: none"> • Different tools (hand, cutting, power, measuring, marking off) are listed and identified • Safe care, correct use and storage of tools and equipment are explained • Use of tools demonstrates correct selection for the work at hand • Measurement calculations are performed correctly and accurately • Measurements from measuring tools are read and interpreted correctly • Speeds, feeds and cutting tools are described correctly • Safety precautions pertaining to tools are explained 	<p>Supporting Evidence:</p> <ul style="list-style-type: none"> • SE0201 Signed-off job cards • SE0202 Non-conformance reports • SE0203 Workplace logbook or portfolio • SE0204 Equipment downtime records
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Ongoing observation during drilling exercises. • Final practical assessment 1 hour with check sheet: <ul style="list-style-type: none"> ○ #Correct drill speeds 		

- #Drilling stance
- #Drill Angle for drilling different type of material
- #Securing and setting up of work piece on table
- #Alignment of work piece with drill bit
- #Pilot holes
- #Correct use of centre drill
- #Drilling pressure
- #Correct selection of drilling lubricant and drill bit
- #Secure drill bit in chuck
- #Correct use of drift
- Practical assessment sharpening drill bits
 - #Drill angle
 - #Face of the drill bit (cutting edge higher than face of the drill bit)
 - #Finishing of the drill bit
 - #Cutting edge should only reach half the diameter of the drill bit
 - #Drill bit face not discoloured

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules

Tools, Equipment and Materials

- Personal Protective Equipment; Overalls; Safety Boots; Safety glasses
- Portable drill
- Fixed drill
- Drill bits (suitable to the drilling machine)
- Deburring tool
- Engineering square
- Materials: Off cuts: Mild steel – pipes, plates, sheets; drilling lubricants

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>E3</h1>
		Curriculum code: 653303000		
Learning area title: Fabricate a range of simple mechanical components and work pieces	Total hours	SDP	WP	
		160	120	
Work situation title: Saw material to specification using a power saw	Total hours	8	8	
Work scenario: Joseph is requested to cut steel segments for a shelf. He has to identify, handle and saw relevant steel to the prescribed length. The safety of all present is his responsibility.				
Prerequisite learning: D1-D3				
Practical skills modules (PM)		Knowledge modules (KM)		Work experience modules (WM)
<p>PM-02-PS09: Saw material to specification using a power saw <i>Given workpiece specifications, material and a power saw,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA0901 Interpret workpiece specifications, material and blade types PA0902 Mark-off and secure the workpiece PA0903 Set-up power saw, speeds and feeds PA0904 Use a power saw in a safe and responsible manner PA0905 Lock-out, clean, remove and store materials 		<p>Knowledge of:</p> <p>KM-01-KT05: Engineering tools and equipment</p> <ul style="list-style-type: none"> KT0501 Hand tools to hold, assemble or disassemble components KT0502 Hand-held cutting tools (saws, blades, files, scrapers, chisels, taps and dies, hand reamers, hand broaching tools, hammers centre punch) KT0503 Hand-held power tools (angle grinder, drills, drill bits and reamers) KT0504 Measurement tools and equipment (basic measurement tools, precision measuring tools, angular measuring tools, inspection gauges) KT0505 Marking-off tools and equipment (punches, scribes, combination sets, protractors, callipers (inside and outside), 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM WM-01-WE02: Fabricate a range of mechanical components in an engineering workshop using power tools and equipment</p> <ul style="list-style-type: none"> WA0206 Saw a minimum of two work pieces to specification <p>Contextualised Workplace Knowledge</p> <ul style="list-style-type: none"> Workplace Hazard Inspection and Risk Assessment procedures Material request & storage procedures Equipment handling and storage procedures Conditions of employment Standard operating procedures

	<p>jenny calliper, engineering square, angle plates, marking-off table, dividers)</p> <p>Applied Knowledge</p> <ul style="list-style-type: none"> • AK0901 Identification, function, use and care of power saws • AK0902 Procedures to saw work pieces using power saws • AK0903 Methods to saw work pieces • AK0904 Sawing safety precautions 	
ASSESSMENT CRITERIA		
<p>PM-02-PS09: Saw material to specification using a power saw</p> <ul style="list-style-type: none"> • The use of power saws is explained and demonstrated • The workpiece is sawn according to procedure and specifications • Risks and hazards are identified and responded to in a responsible manner 	<ul style="list-style-type: none"> • Different tools (hand, cutting, power, measuring, marking off) listed & identified • Safe care, correct use and storage of tools and equipment are explained • Use of tools demonstrates correct selection for the work at hand • Measurement calculations are performed correctly and accurately • Measurements from measuring tools are read and interpreted correctly • Speeds, feeds and cutting tools are described correctly • Safety precautions pertaining to tools are explained 	<p>Supporting Evidence</p> <ul style="list-style-type: none"> • SE0201 Signed-off job cards • SE0202 Non-conformance reports • SE0203 Workplace logbook or portfolio • SE0204 Equipment downtime records
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Ongoing observation with checklist <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material on defined Knowledge and Practical Skills Modules 		

Tools, Equipment and Materials

- Personal Protective Equipment; Overalls; Safety Boots; Safety glasses, Gloves
- Power saw
- Materials: Mild steel various shapes and sizes

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>E4</h1>
		Curriculum code: 653303000		
Learning area title: Fabricate a range of simple mechanical components and work pieces	Total hours	SDP	WP	
		160	120	
Work situation title: Grind material to specifications using a pedestal grinder	Total hours	24	16	
Work scenario: Joseph is requested to remove the burr from a chisel, punch, scribe and face a flat screwdriver. He has to identify, handle and grind relevant items to the prescribed standard. The safety of all present is his responsibility.				
Prerequisite learning: D1-D3				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-02-PS03 Grind material to specifications using a pedestal grinder <i>Given workpiece specifications, a pedestal grinder, grinding wheels, drill bits and chisels,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA020301 Plan and prepare to grind workpieces PA020302 Select grinding wheel to match grinding assignment PA020303 Remove and replace grinding wheels PA020304 Dress grinding wheels PA020305 Set-up pedestal grinder and set tool rest PA020306 Grind drill bits, high speed steel tool bits and chisels PA020307 Use a pedestal grinder in a safe and responsible manner 	<p>Knowledge of:</p> <p>Types and working principles of pedestal grinding machine</p> <ul style="list-style-type: none"> Working principles of a pedestal-grinding machine Grinding machine types, parts and attachments Terminology and components Wheel selection Balancing, mounting and dressing <p><u>Applied Knowledge</u></p> <ul style="list-style-type: none"> AK020301 Identification, function, use of and care for grinding power tools and machines AK020302 Procedures to grind work pieces using a grinding power tools and machines 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM-01-WE02: Fabricate a range of mechanical components in an engineering workshop using power tools and equipment</p> <ul style="list-style-type: none"> WA0203 Sharpen a minimum of two chisels using fixed grinding machines WA0204 Sharpen a range of cutting tools using fixed grinding machines WA0205 Replace and dress a grinding wheel WA0207 Cut and grind a minimum of two work pieces to specification <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> Workplace Hazard Inspection and Risk Assessment procedures Material request & storage procedures 	

	<ul style="list-style-type: none"> • AK020303 Methods to dress grinding wheels • AK020304 Grinding safety precautions 	<ul style="list-style-type: none"> • Equipment handling and storage procedures • Conditions of employment • Standard operating procedures
ASSESSMENT CRITERIA		
<p>PM-02-PS03 Grind material to specifications using a pedestal grinder</p> <ul style="list-style-type: none"> • The uses of fixed grinding power tools and machines are explained and demonstrated • The work piece is /ground according to procedure and specifications • Grinding wheels dressed correctly • Risks and hazards are identified and responded to in a responsible manner • Safety precautions are met 	<ul style="list-style-type: none"> • Working principles of a pedestal grinding machine are explained • Components of a pedestal grinding machine are identified and discussed • Wheel are identified and selected • Balancing, mounting and dressing procedures are explained • Safety precautions pertaining to a pedestal grinder are explained 	<p>Supporting Evidence</p> <ul style="list-style-type: none"> • SE0101 Signed-off job cards • SE0102 Non-conformance reports • SE0103 Workplace logbook or portfolio • SE0104 Equipment downtime records
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Use of pedestal grinding machine <ul style="list-style-type: none"> ○ The uses of fixed grinding power tools and machines are explained and demonstrated ○ The workpiece is ground according to procedure and specifications ○ Grinding wheels are dressed correctly ○ Risks and hazards are identified and responded to in a responsible manner ○ Distance between wheel and tool rest not more than 2mm ○ Tool rest set at correct attack angle • Practical assessment sharpening chisel <ul style="list-style-type: none"> ○ #Chisel cutting angle 60 degrees ○ #Straightness of cutting edge ○ #No discolouration of cutting edge ○ #Removal of mushroom head • Practical assessment sharpening of prick/centre punch 		

- #Prick punch cutting angle 45 degrees
- #Centre punch cutting angle 60 degrees
- #No discolouration of tip
- #No oval grinding
- Practical assessment sharpening of scribe
 - #Scribe cutting angle as specified by facilitator
 - #No discolouration of scribing edge
- Practical assessment sharpening of flat screwdriver
 - #Straightness and thickness of driving edge
 - #No discolouration of driving edge
 - #In line with angle
- Level of competence required: 80%

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots, Safety shield;
- Pedestal grinder; drill bits, chisel, punch, scribes and screwdriver

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>E5</h1>
		Curriculum code: 653303000		
Learning area title: Fabricate a range of simple mechanical components and work pieces	Total hours	SDP	WP	
		160	120	
Work situation title: Cut threads with stocks, dies and taps (Ream parallel and tapered holes)	Total hours	40	32	
Work scenario: Happiness is presented with a cover for a flange and requested to thread the holes. She has to identify the material by referring to a drawing and considering the size and tensile strength. She must select the tools and inspect the work area. She then has to measure, saw, mark off and drill material to specification. The safety of all present is her responsibility.				
Prerequisite learning: D1-D3, E1-E2				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-01-PS11: Cut threads with stocks, dies and taps <i>Given specifications, a range of materials, stocks, dies and taps, and hand tools</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA1101 Interpret work piece specifications PA1102 Interpret tap and drill charts PA1103 Select hand tools, equipment and lubrication PA1104 Cut threads using stocks and dies PA1105 Tap holes PA1106 Conduct post fabrication activities PA1107 Demonstrate adherence to safe and environmentally responsible practices during all the stages of the assignment 	<p>Knowledge of:</p> <p>KM-01-KT05 Engineering tools and equipment</p> <ul style="list-style-type: none"> KT0501 Hand tools to hold, assemble or disassemble components KT0502 Hand-held cutting tools (saws, blades, files, scrapers, chisels, taps and dies, hand reamers, hand broaching tools, hammers centre punch) KT0503 Hand-held power tools (angle grinder, drills, drill bits and reamers) KT0504 Measurement tools and equipment (basic measurement tools, precision measuring tools, angular measuring tools, inspection gauges) KT0505 Marking-off tools and equipment (punches, scribes, combination sets, protractors, callipers (inside and outside), 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM-01-WE01: Fabricate a variety of simple components using basic hand skills and tools</p> <ul style="list-style-type: none"> WA0106 Tap and ream a minimum of two different sized holes to specifications <p>Contextualised Workplace Knowledge</p> <ul style="list-style-type: none"> Workplace Hazard Inspection and Risk Assessment procedures Material request & storage procedures Equipment handling and storage procedures Conditions of employment Standard operating procedures 	

<p>PM-01-PS12: Ream parallel and tapered holes <i>Given specifications, a range of materials, reamers and hand tools</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA1201 Interpret workpiece specifications • PA1202 Interpret reaming charts • PA1203 Select hand tools, equipment and lubrication • PA1204 Ream holes • PA1205 Conduct post fabrication activities • PA1206 Demonstrate adherence to safe and environmentally responsible practices during all the stages of the assignment 	<p>jenny calliper, engineering square, angle plates, marking-off table, dividers)</p> <p>KM-01-KT07 Types and applications of screw threads</p> <ul style="list-style-type: none"> • KT0701 Terminology related to screw threads (pitch, root diameter, nominal diameter, lead, flank, internal and external threads, helix angle, included angle) • KT0702 Screw threads (v-thread, acme, and square threads) • KT0703 Application of screw threads • KT0704 Thread calculations <p><u>Applied Knowledge</u></p> <p>PM-01-PS11: Cut threads with stocks, dies and taps</p> <ul style="list-style-type: none"> • AK1101 Procedures to plan and prepare for cutting threads and tapping and reaming holes • AK1102 Identification, function, use and care of hand tools • AK1103 Identification, reading, calibration, use and care of measuring equipment and instruments • AK1104 Allowances, tolerances and fits • AK1105 Types and applications of reamers, stocks and dies, and lubricants • AK1106 Procedures to cut threads using stocks and dies • AK1107 Procedures to ream holes • AK1108 Procedures to tap holes • AK1109 Practices related to quality, 	
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	<p>health, safety and protection of the environment when cutting threads and tapping and reaming holes</p> <p>PM-01-PS12: Ream parallel and tapered holes</p> <ul style="list-style-type: none"> • AK1201 Procedures to plan and prepare for reaming holes • AK1202 Identification, function, use and care of hand tools • AK1203 Identification, reading, calibration, use and care of measuring equipment and instruments • AK1204 Allowances, tolerances and fits • AK1205 Types and applications of reamers, stocks and dies, and lubricants • AK1206 Procedures to ream holes using reamers • AK1207 Practices related to quality, health, safety and protection of the environment when cutting threads and tapping and reaming holes 	
ASSESSMENT CRITERIA		
<p>PM-01-PS11: Cut threads with stocks, dies and taps</p> <ul style="list-style-type: none"> • Hand tools, equipment and lubrication requirements for cutting threads and reaming and tapping holes are explained • Threads are cut according to procedures and specifications • Holes are reamed according to procedures and specifications 	<p>KM-01-KT05 Engineering tools and equipment</p> <ul style="list-style-type: none"> • Different tools (hand, cutting, power, measuring, marking off) are listed and identified • Safe care, correct use and storage of tools and equipment are explained • Use of tools demonstrates correct selection for the work at hand 	<p>Supporting Evidence:</p> <ul style="list-style-type: none"> • SE0101 Signed-off job cards • SE0102 Non-conformance reports • SE0103 Workplace logbook or portfolio • SE0104 Equipment downtime records

<ul style="list-style-type: none"> • Holes are tapped according to procedures and specifications • Safety and environmental protection practices are adhered to • Hand tools, equipment and lubrication requirements for cutting threads and reaming and tapping holes are explained <p>PM-01-PS12: Ream parallel and tapered holes</p> <ul style="list-style-type: none"> • Threads are cut according to procedures and specifications • Holes are reamed according to procedure and specifications • Holes are tapped according to procedure and specifications • Safety and environmental protection practices are adhered to 	<ul style="list-style-type: none"> • Measurement calculations are performed correctly and accurately • Measurements from measuring tools are read and interpreted correctly • Speeds, feeds and cutting tools are described correctly • Safety precautions pertaining to tools are explained <p>KM-01-KT07 Types and applications of screw threads</p> <ul style="list-style-type: none"> • Types of screw threads are read and identified • Thread terminology is explained and the profile of a thread is drawn • Freehand drawing of threads are produced with accurate resemblance to original object in terms of dimensions, shape and size • Application of screw threads is discussed • The depth of different threads is calculated 	
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 15 questions and the competency will be at 80% • Practical exercise of 1Hour length covering above <ul style="list-style-type: none"> ○ Holes taped square ○ Tools and equipment may not be damaged ○ Tools used, must be clean and neat at all times ○ All safety aspects adhered to according to company policies ○ No injury ○ Manufacture work piece according to notes and tolerances on drawing 		

- Reaming charts interpreted correctly
- Lubrication spillage cleaned correctly
- Tapping must be done free hand
- Level of competence required: 80%
- Level of safety aspects must be: 100%

Learning resources for teaching

- Learning material covering defined Knowledge and Practical Skills Modules
- Samples (and charts) of tapping and all the dangers
- Samples (and charts) of different taps and pitches
- Safe Operating Procedure and Safe Working Procedure for tapping and reaming
- Charts of risk assessment procedure and safety measures
- Videos of tapping and reaming will be an added advantage
- Material Safety Data Sheets for reference

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots, leather gloves
- Material to work on
- Hand Tools: Stocks, Taps, Dies, Drills, Engineering square, Hammer, Punch, venier, scriber and reamer.

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		F1	
		Curriculum code: 653303000			
Learning area title: Fabricate complex mechanical components and work pieces		Total hours	SDP		WP
		176	104		
Work situation title: Fabricate and fit gaskets		Total hours	16	24	
Work scenario: Lesego is requested to replace a seal on a water system that has a leak. She is required to use the flanges of the installation as a template She has to identify the material by considering the thickness, the liquid being transferred and pressure in the installation. She must select the tools and work area. The safety of her and all present is her responsibility					
Prerequisite learning: E, D					
INTEGRATED LEARNING CONTENT					
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)		
<p>PM-01-PS07 Fabricate and fit a gasket <i>Given gasket specifications or samples, materials and hand tools</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA0701 List the quality criteria and specifications required PA0702 Select the material, tools and equipment required for the assignment PA0703 Describe the sequence of work to fabricate the gasket PA0704 Identify and list potential hazards and risks related to the assignments PA0705 Mark-off, fabricate and fit the gaskets PA0706 Demonstrate adherence to safe and environmentally responsible practices during all the stages of the assignment 	<p>Knowledge of:</p> <p>KM-02-KT01: Static and dynamic seals and gaskets</p> <ul style="list-style-type: none"> KT010601 Seals and gaskets <p><u>Applied Knowledge</u></p> <ul style="list-style-type: none"> AK0701 Procedures to plan and prepare for fabrication of gaskets AK0702 Identification, function, use and care of hand tools for gasket fabrication AK0703 Identification, reading, calibration, use and care of measuring equipment and instruments AK0704 Allowances, tolerances and fits AK0705 Types and applications of engineering materials AK0706 Types and applications of gaskets AK0707 Torques prescribed for tightening gaskets 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM-01-WE01: Fabricate a variety of simple components using basic hand skills and tools</p> <ul style="list-style-type: none"> WA0102 Mark-off, cut and fit a minimum of two gaskets to specifications using different materials <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> Workplace Hazard Inspection and Risk Assessment procedures Material request & storage procedures Equipment handling and storage procedures Conditions of employment Standard operating procedures 		

	<ul style="list-style-type: none"> AK0708 Practices related to quality, health, safety and protection of the environment when fabricating and fitting gaskets 	
ASSESSMENT CRITERIA		
<ul style="list-style-type: none"> Gasket material requirements are explained for different applications Gaskets are fabricated correctly to specifications Gaskets are fitted correctly to specification Safety and environmental protection practices are adhered to 	<ul style="list-style-type: none"> The definitions of seals and gaskets are discussed The types and functions of packings, seals, gaskets and glands are discussed The applications of different gaskets for air, steam, liquids, chemicals and gases are explained Safety precautions pertaining to static and dynamic seals and gaskets are explained 	<p>Supporting Evidence:</p> <ul style="list-style-type: none"> SE0101 Signed-off job cards SE0102 Non-conformance reports SE0103 Workplace logbook or portfolio SE0104 Equipment downtime records
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> Internal knowledge test of a minimum of 15 questions and the competency will be at 80% Practical exercise of 1hr 30min length covering <ul style="list-style-type: none"> Standard time 1 hour 30 min Apparatus may not be damaged Bearing surface to carry 60% of key length No burs allowed Tools must be clean and neat No injury or unsafe act had occurred Sides of key must be parallel (0,05) Finishing (N7 standard) Level of competence required: 80% 		

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of different seals used in the field
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- CDs and videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment; Overalls; Safety Boots
- Mechanical Fitter standard toolbox (see list supplied by NAMB)
- Mechanical Flanges to fit a gasket
- Gasket Material

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>F2</h1>
		Curriculum code: 653303000		
Learning area title: Fabricate complex mechanical components and work pieces	Total hours	SDP	WP	
		176	104	
Work situation title: Fabricate and fit keys and locking devices	Total hours	80	40	
Work scenario: Manini is requested to replace a key on a belt and pulley system that drives a water pump. She has to identify the material by considering the size and tensile strength. She must select the tools and work area. She then has to cut, file and fit the key to the prescribed standard. The safety of her and all present is her responsibility.				
Prerequisite learning: B, D, E				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-01-PS10: Fabricate and fit a key <i>Given specifications of a range of keys, a range of materials and hand tools the learner must be able to:</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA1001 List the quality criteria and specifications required PA1002 Select the material, tools and equipment required for the assignment PA1003 Describe the sequence of work to fabricate and fit the key PA1004 Identify and list potential hazards and risks related to the assignments PA1005 Mark-off, fabricate and fit the key PA1006 Conduct post fabrication and fitting activities PA1007 Demonstrate adherence to safe and environmentally responsible practices during all the stages of the assignment 	<p>Knowledge of:</p> <p>KM-01-KT08: Types and function of locking devices and fasteners</p> <ul style="list-style-type: none"> KT0801 Fasteners and locking devices (machine screws, set screws, cap screws, grub screw, studs, locking nuts and bolts, washers, circlips, pins, keys) KT0802 Application of fasteners and locking devices KT0803 Drawings of fasteners and locking devices <p><u>Applied Knowledge</u></p> <p>PM-01-PS10: Fabricate and fit a key</p> <ul style="list-style-type: none"> AK1001 Procedures to plan and prepare for fabricating and fitting keys AK1002 Identification, function, use and care of hand tools 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM-01-WE01: Fabricate a variety of simple components using basic hand skills and tools</p> <ul style="list-style-type: none"> WA0105 Mark-off and fabricate a minimum of two keys to specification <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> Workplace Hazard Inspection and Risk Assessment procedures Material request & storage procedures Equipment handling and storage procedures Conditions of employment Standard operating procedures 	

<p>Fabricate and fit locking devices <i>Given specifications of a range of keys, a range of materials and hand tools the learner must be able to:</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA1001 List the quality criteria and specifications required • PA1002 Select the material, tools and equipment required for the assignment • PA1003 Describe the sequence of work to fabricate and fit locking devices • PA1004 Identify and list potential hazards and risks related to the assignments • PA1005 Mark-off, fabricate and fit the key • PA1006 Conduct post fabrication and fitting activities • PA1007 Demonstrate adherence to safe and environmentally responsible practices during all the stages of the assignment • Manufacture a gib-head, parallel, taper and feather key • Fit a gib-head, parallel, taper, feather key. • Install the following locking devices - lock-nuts, dowels, lock-plates, split pins, taper pins and wire method. • Remove a gib-head, parallel, taper and feather key 	<ul style="list-style-type: none"> • AK1003 Identification, reading, calibration, use and care or measuring equipment and instruments • AK1004 Allowances, tolerances and fits • AK1005 Types and applications of keys • AK1006 Procedures to fabricate and fit keys • AK1007 Practices related to quality, health, safety, and protection of the environment when fabricating and fitting keys 	
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ASSESSMENT CRITERIA

PM-01-PS10: Fabricate and fit a key

- IAC1001 Hand tools required for fabricating keys are identified and used
- IAC1002 Keys/**locking devices** are fabricated correctly to specifications
- IAC1003 Keys/**locking devices** are fitted correctly to specifications
- IAC1004 Safety and environmental protection practices are adhered to

Fabricate and fit locking devices

- Different locking devices fitted and removed according to standards
- Manufacture a gib-head, parallel, taper and feather key correctly
- Fit a gib-head, parallel, taper, feather key correctly
- Install the following locking devices: lock-nuts, dowels, lock-plates, split pins, taper pins and wire method correctly
- Remove a gib-head, parallel, taper and feather key correctly
- Identify nuts and bolts correctly
- Tighten nuts and bolts correctly

- Types of fasteners and locking devices are identified and discussed
- Application of fasteners and locking devices is explained
- Fasteners and locking devices are read and interpreted from drawings
- Freehand drawings of different types of fasteners and locking devices are produced
- Safety precautions pertaining to fasteners and locking devices are explained
- Identify the following types of keys - gib-head, parallel, taper, feather, woodruff and tangential, with their advantages and disadvantages

Supporting Evidence

- SE0101 Signed-off job cards
- SE0102 Non-conformance reports
- SE0103 Workplace logbook or portfolio
- SE0104 Equipment downtime records

Internal Assessment to be performed

- Internal knowledge test of a minimum of 15 questions and the competency will be at 80%
- Practical exercise of 1hr 30min length
 - Apparatus may not be damaged
 - Bearing surface to carry 60% of key length

- No burs allowed
- Tools must be clean and neat
- No injury or unsafe act had occurred
- Sides of key must be parallel (0,05)
- Finishing (N7 standard)
- Level of competence required: 80%

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules

Tools, Equipment and Material

- Personal Protective Equipment; Overalls; Safety Boots; Safety
- Taper key hub and bush, Key Steel
- Measuring equipment; Vernier; telescopic gauges; inside callipers; Micrometres; steel ruler;
- Hand Tools: Bustard File; Second Cut File; smooth file; file brush; paint brush; marking blue past; hacksaw and blade; scriber; engineering square; small hammer;

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		F3
		Curriculum code: 653303000		
Learning area title: Fabricate complex mechanical components and work pieces	Total hours	SDP	WP	
		176	104	
Work situation title: Fabricate a flange & other suitable components	Total hours	80	40	
Work scenario: Manini is requested to manufacture a flange that must be welded to a pipe that is fit as part of a construction. The assembly will then be mounted to complete the section. She has to identify the material by considering the size and tensile strength. She must select the tools and inspect the work area. She then has to measure, saw, mark off and drill material to specification and weld the workpiece. The safety of her and all present is her responsibility.				
Prerequisite learning: B, D, E				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-02: Fabricate components or work pieces using power tools or equipment <i>Given specifications or samples, materials and hand tools</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> List component specifications including tolerances and sizes from the assignment List material, tool and equipment requirements Describe the sequence of work to fabricate the different components Identify and list potential hazards and risks related to the assignments 	<p>Knowledge of:</p> <p>KM-01-KT05: Engineering tools and equipment</p> <ul style="list-style-type: none"> KT0501 Hand tools to hold, assemble or disassemble components KT0502 Hand-held cutting tools (saws, blades, files, scrapers, chisels, taps and dies, hand reamers, hand broaching tools, hammers centre punch) KT0503 Hand-held power tools (angle grinder, drills, drill bits and reamers) KT0504 Measurement tools and equipment (basic measurement tools, precision measuring tools, angular measuring tools, inspection gauges) KT0505 Marking-off tools and equipment (punches, scribes, combination sets, protractors, callipers) 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM-01-WE01: Fabricate a variety of simple components using basic hand skills and tools</p> <ul style="list-style-type: none"> WA0101 Mark-off and fabricate a minimum of two flanges to given specifications <p>Contextualised Workplace Knowledge</p> <ul style="list-style-type: none"> Workplace Hazard Inspection and Risk Assessment procedures Material request & storage procedures Equipment handling and storage procedures Conditions of employment 	

	<p>(inside and outside), jenny calliper, engineering square, angle plates, marking-off table, dividers</p> <p><u>Applied Knowledge</u></p> <ul style="list-style-type: none"> • AK0101 Procedures to plan and prepare for fabrication of components • AK0102 Material identification, types and profiles • AK0103 Practices related to quality, health, safety, and protection of the environment 	<ul style="list-style-type: none"> • Standard operating procedures
ASSESSMENT CRITERIA		
<ul style="list-style-type: none"> • The fabrication of the components is planned according to accepted sequences • Specifications and quality criteria that must be met are clearly linked to the specific instruction • Tools, equipment and materials required are identified correctly • Risks/hazards correctly identified & listed • Consequences of mistakes in the planning and preparation of the manufacturing task described correctly • The use of fixed drilling machines is explained and demonstrated • The work piece is drilled according to procedure and specifications • Drill bits are sharpened to specifications • Risks and hazards are identified and responded to in a responsible manner 	<ul style="list-style-type: none"> • Different tools (hand, cutting, power, measuring, marking off) are listed and identified • Safe care, correct use and storage of tools and equipment are explained • Use of tools demonstrates correct selection for the work at hand • Measurement calculations are performed correctly and accurately • Measurements from measuring tools are read and interpreted correctly • Speeds, feeds and cutting tools are described correctly • Safety precautions pertaining to tools are explained 	<p>Supporting Evidence</p> <ul style="list-style-type: none"> • SE0101 Signed-off job cards • SE0102 Non-conformance reports • SE0103 Workplace logbook or portfolio • SE0104 Equipment downtime records

<ul style="list-style-type: none"> Lubricants and coolants are used according to manufacturer's specifications 		
<p>Internal Assessment to be performed:</p> <ul style="list-style-type: none"> Internal knowledge test of a minimum of 20 questions and the competency will be at 80% Practical exercise: Standard time 1 hour 30 min <ul style="list-style-type: none"> Apparatus may not be damaged The flange is marked off and drilled as specified on the drawing The centre lines within 0.5mm from the centre of the material. The diameters of the holes may not be more than 0.1mm bigger than the drill diameter. Distances between the drilled holes may not vary by more than 0.5mm. PCD Tolerance: $\pm 0.5\text{mm}$ Holes must be drilled at 90 deg to surface of the flange No burs allowed Tools must be clean and neat No injury or unsafe act had occurred Finishing (N7 standard) Level of competence required: 80% <p>Learning resources for teaching</p> <ul style="list-style-type: none"> Learning material covering defined Knowledge and Practical Skills Modules Samples (and charts) of different flanges Safe Operating Procedure and Safe Working Procedure for manufacturing a flange Charts of risk assessment procedure and safety measures for manufacturing a flange CDs and videos of for manufacturing a flange/other suitable components will be an added advantage <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> Personal Protective Equipment; Overalls; Safety Boots; Safety Flat Mild steel Measuring equipment; Vernier; inside callipers; Micrometres; steel ruler; Hand Tools: smooth file; file brush; paint brush; marking blue past; scribe; engineering square; small hammer; pin punch 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1 style="color: red;">G1</h1>
		Curriculum code: 653303000		
Learning area title: Perform basic welding, cutting, brazing on engineering materials	Total hours	SDP	WP	
		80	120	
Work situation title: Gas cut metal to specification	Total hours	16	40	
Work scenario: Jenna is working at the holding furnace. She has to replace the inlet spout as per the maintenance schedule. The bolts retaining the inlet spout are damaged to the extent that a spanner or wrench can no longer be used to loosen them. Jenna must use Oxyacetylene equipment to cut the bolts in order to remove them. The safety of her and her fellow employees are her responsibility.				
Prerequisite learning: B, D, E				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-02-PS08 Gas cut metal to specification <i>Given work piece specifications, materials, tools and gas cutting equipment,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0801 Mark-off workpieces • PA0802 Set-up gas cutting equipment and workpieces • PA0803 Cut material to specification • PA0804 Conduct post gas cutting activities • Apply pre-assessment on gas cutting equipment • Detect gas leaks • Perform Shut down procedures • Performance assessment report for completion of work situation 	<p>Knowledge of:</p> <p>M-01-KT09: Principles, equipment and methods of arc welding, gas welding, cutting, brazing and silver soldering</p> <ul style="list-style-type: none"> • KT0901 Arc welding and gas welding and cutting equipment and consumables • KT0902 Arc welding and gas welding and cutting techniques and principles • KT0903 Material selection • KT0904 Cutting and welding defects • KT0905 Safe handling of gas cylinders • KT0906 Health and safety risks and protective equipment and measures <p><u>Applied Knowledge</u></p> <ul style="list-style-type: none"> • AK0801 Identification, function, use and care of gas cutting equipment • AK0802 Procedures to gas cut work pieces using gas cutting equipment 		<p>The apprentice will be expected to gain practical experience and engage in the following work activities:</p> <p>WM-01-WE02: Fabricate a range of mechanical components in an engineering workshop using power tools and equipment</p> <ul style="list-style-type: none"> • WA0208 Gas cut a minimum of two work pieces to specification using gas cutting equipment <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Conditions of employment • Standard operating procedures 	

	<ul style="list-style-type: none"> • AK0803 Gas cutting methods • AK0804 Gas cutting safety precautions 	
ASSESSMENT CRITERIA		
<ul style="list-style-type: none"> • The use of gas cutting equipment is explained and demonstrated • The work piece is gas cut according to procedure and specifications • Risks and hazards are identified and responded to in a responsible manner • Safety precautions are met 	<ul style="list-style-type: none"> • The use of gas cutting equipment is explained and demonstrated • The work pieces are gas cut according to procedure and specifications • Risks and hazards are identified and responded to in a responsible manner • Cutting defects are described • Safety precautions pertaining to gas cutting are explained 	<p>Supporting Evidence:</p> <ul style="list-style-type: none"> • SE0201 Signed-off job cards • SE0202 Non-conformance reports • SE0203 Workplace logbook or portfolio • SE0204 Equipment downtime records
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 20 questions and the competency will be at 80% • Practical exercise of 30min length <ul style="list-style-type: none"> ○ All safety aspects adhered to ○ No injury ○ Start up and shut down of the Gas cutting correctly done ○ Pre inspection correctly done and all parts identified ○ No damage to equipment ○ Nozzles cleaned correctly ○ Level of Safety aspects must be 100% ○ Level of competence required: 80% <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material on defined Knowledge and Practical Skills Modules • Samples (and charts) of gas and all the dangers • Safe Operating Procedure and Safe Working Procedure for Gas Cutting 		

- Charts of risk assessment procedure and safety measures for Gas Cutting
- CDs and videos of Gas Cutting will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Gas welding goggles or face shield, spats, apron, yoke, leather gloves
- Material to cut
- Hand Tools, Gas cutting equipment (Oxygen and acetylene cylinders, flashback arresters, pipe, cutting torch, different nozzles)

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1 style="color: red;">G2</h1>
		Curriculum code: 653303000		
Learning area title: Perform basic welding, cutting, brazing on engineering materials	Total hours	SDP	WP	
		80	120	
Work situation title: Arc weld metal to specification	Total hours	40	40	
Work scenario: Cameron is tasked to install a new water line. He is required to manufacture brackets on which the pipeline will be mounted. The manufacturing is according to a given drawing. He must weld the cut steel in order to make the brackets.				
Prerequisite learning: B, D, E				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-02-PS06: Arc weld metal to specification <i>Given gasket specifications or samples, materials and hand tools:</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0601 Select welding rods required • PA0602 Set-up arc welding machine and workpieces • PA0803 Perform a fillet weld in the flat position (1F), including fitting and tacking • PA0604 Perform a fillet weld in the horizontal position (2F), including fitting and tacking • PA0605 Perform a fillet weld in the vertical up position (3F), including fitting and tacking • PA0606 Use an arc-welding machine in a safe and responsible manner • PA0607 Conduct post welding activities • Performance assessment report for completion of work situation 	<p>Knowledge of:</p> <p>KM-01-KT09: Principles, equipment and methods of arc welding, gas welding, cutting, brazing and silver soldering</p> <ul style="list-style-type: none"> • KT0901 Arc welding and gas welding and cutting equipment and consumables • KT0902 Arc welding and gas welding and cutting techniques and principles • KT0903 Material selection • KT0904 Cutting and welding defects • KT0905 Safe handling of gas cylinders • KT0906 Health and safety risks and protective equipment and measures <p><u>Applied Knowledge</u></p> <p>PM-02-PS06: Arc weld metal to specification</p> <ul style="list-style-type: none"> • AK0601 Identification, function, use and care of arc welding equipment • AK0602 Procedures to arc weld 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM-01-WE02: Fabricate a range of mechanical components in an engineering workshop using power tools and equipment</p> <ul style="list-style-type: none"> • WA0209 Arc weld a minimum of two work pieces to specification using an arc welding machine <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Conditions of employment • Standard operating procedures 	

<ul style="list-style-type: none"> • Perform good house keeping 	<p>workpieces using an arc-welding machine</p> <ul style="list-style-type: none"> • AK0603 Methods and different arc welding positions • AK0604 Arc welding safety colour markings and symbols • AK0605 Arc welding safety precautions • AK0606 Fitting and tack welding techniques and practices 	
ASSESSMENT CRITERIA		
<ul style="list-style-type: none"> • The uses of arc welding machines are explained and demonstrated • The workpiece is arc welded according to procedure and specifications • Risks and hazards are identified and responded to in a responsible manner 	<ul style="list-style-type: none"> • Arc welding equipment is described • Arc welding techniques and principles are discussed • Material is identified and selected according to applications • Welding defects are described • Safety precautions pertaining to arc welding and gas cutting are explained 	<p>Supporting Evidence:</p> <ul style="list-style-type: none"> • SE0201 Signed-off job cards • SE0202 Non-conformance reports • SE0203 Workplace logbook or portfolio • SE0204 Equipment downtime records
<p>Internal Assessment to be performed:</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 20 questions and the competency will be at 80% • Practical exercise of 1hr length covering <ul style="list-style-type: none"> ○ All safety aspects adhered to ○ No Injuries ○ No damage to equipment ○ All welding joint 80% correct ○ Level of competence required: 80% 		

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of different welding joints
- Safe Operating Procedure and Safe Working Procedure for Arc Welding
- Charts of risk assessment procedure and safety measures for Arc Welding
- CDs and videos of Arc Welding will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Welding gloves, Safety Goggles, spats, apron, welding helmet
- Material and consumables
- Measuring equipment; Hand Tools; welding equipment, Arc welding machine, Power tools

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>G3</h1>
		Curriculum code: 653303000		
Learning area title: Perform basic welding, cutting, brazing on engineering materials	Total hours	SDP	WP	
		80	120	
Work situation title: Gas weld, silver solder and braze metal to specification	Total hours	40	40	
Work scenario: Mario is requested to join a steel section with the use of Gas weld, silver solder and braze metal to specification. He has to identify, handle measure and weld relevant section to the prescribed standard. The safety of all present is his responsibility.				
Prerequisite learning: B, D, E				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-02-PS07: Gas weld, silver solder and braze metal to specification <i>Given workpiece specifications, materials, tools and gas welding equipment</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA0601 Set-up gas welding equipment and workpiece PA0602 Use gas welding equipment in a safe and responsible manner PA0603 Adjust the flame and pressure settings PA0604 Perform gas welds, silver soldering and brazing PA0605 Conduct post gas welding activities 	<p>Knowledge of:</p> <p>KM-03-KT07: Principles, equipment and methods of arc welding, gas welding, cutting, brazing and silver soldering</p> <ul style="list-style-type: none"> KT0701 Arc welding and gas welding and cutting equipment and consumables KT0702 Arc welding and gas welding and cutting techniques and principles KT0703 Material selection KT0704 Cutting and welding defects KT0705 Safe handling of gas cylinders KT0706 Health and safety risks and protective equipment and measures 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM-01-WE02: Fabricate a range of mechanical components in an engineering workshop using power tools and equipment</p> <ul style="list-style-type: none"> WA0208 Gas weld a minimum of two work pieces to specification using gas welding equipment <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> Workplace Hazard Inspection and Risk Assessment procedures Material request & storage procedures Equipment handling and storage procedures Conditions of employment Standard operating procedures 	

	<p><u>Applied Knowledge</u></p> <ul style="list-style-type: none"> • AK0601 Identification, function, use and care of gas welding equipment • AK0602 Procedures to gas weld work pieces using gas-welding equipment • AK0603 Gas welding safety colour markings and symbols • AK0604 Gas welding methods • AK0605 Gas welding safety precautions 	
ASSESSMENT CRITERIA		
<ul style="list-style-type: none"> • The uses of gas welding equipment are explained and demonstrated • Equipment is set up correctly • The work pieces are gas welded according to procedure and specifications • Risks and hazards are identified and responded to in a responsible manner • Safety precautions are adhered to 	<ul style="list-style-type: none"> • The uses of gas welding equipment are explained and demonstrated • Equipment is set up correctly • The work pieces are gas welded according to procedure and specifications • Risks and hazards are identified and responded to in a responsible manner • Safety precautions are adhered to 	<p>Supporting Evidence:</p> <ul style="list-style-type: none"> • SE0201 Signed-off job cards • SE0202 Non-conformance reports • SE0203 Workplace logbook or portfolio • SE0204 Equipment downtime record
<p>Internal Assessment to be performed:</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 15 questions and the competency will be at 80% • Practical exercise: <ul style="list-style-type: none"> ○ Standard time 1 hour 30 min • Level of competence required: 80% <ul style="list-style-type: none"> ○ No injury ○ Start up and shut down of the Gas welding correctly done 		

- Pre inspection correctly done and all parts identified
- No damage to equipment
- Nozzles cleaned correctly
- Level of Safety aspects must be 100%
- Level of competence required: 80%

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of gas and all the dangers
- Safe Operating Procedure and Safe Working Procedure for Gas welding
- Charts of risk assessment procedure and safety measures for Gas welding
- CDs and videos of for Gas welding will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Gas welding goggles or face shield, spats, apron, yoke, leather gloves.
- Material to cut
- Hand Tools, Gas cutting equipment (Oxygen and acetylene cylinders, flashback arresters, pipe, cutting torch, different nozzles)

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>H1</h1>
		Curriculum code: 653303000		
Learning area title: Perform work activities on gearboxes and drives	Total hours	SDP	WP	
		224	224	
Work situation title: Perform routine maintenance, fault finding, repair and alignment on gearboxes	Total hours	40	40	
Work scenario: Dingane is called to a breakdown on a crusher. On arrival he determines that the electrical motor is turning, but the crusher has stopped. He has to determine the cause and repair the breakdown and put the crusher back in service.				
Prerequisite learning: Year 1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-03-PS02: Disassemble, clean and inspect gearboxes</p> <p><i>Given a selection of gearboxes, relevant tools, personal protective equipment, specifications, cleaning materials and solvents</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA0201 Plan and prepare workplace for disassembling gearbox PA0202 Identify potential hazards and risks related to the job and list the appropriate responses PA0203 Select tools and cleaning materials PA0204 Drain and visually inspect condition of oil PA0205 Disassemble and record gearbox component or part numbers and specifications (including floats) 	<p>Knowledge of:</p> <p>KM-02-KT06: Mechanical working principles, types and applications of reduction gearboxes</p> <ul style="list-style-type: none"> KT0601 Gearboxes (single reduction, double reduction, variable speed) KT0602 Terminology of gearboxes KT0603 Functions and working principles of gearboxes KT0604 Removal and installation procedures for gearboxes <p>KM-02-KT13: Diagnostic techniques</p> <ul style="list-style-type: none"> KT1301 Diagnostic equipment KT1302 Diagnostic techniques KT1303 Diagnostic testing 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p><u>ROUTINE MAINTENANCE</u> WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> Observe (WA0101) / conduct under supervision (WA0201) / conduct (WA0301) inspection processes, safety 	

<ul style="list-style-type: none"> • PA0206 Clean gearbox components • PA0207 Visually inspect component condition (wear, damage, defect, failure) according to Original Equipment Manufacturer (OEM) specifications • PA0208 Conduct post-disassembling activities <p>PM-04-PS01: Replace gearbox components and assemble gearboxes <i>Given a selection of various types of gearbox, relevant tools, personal protective equipment and specifications</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0101 Plan and prepare for replacement of gearbox components and assembly of a gearbox • PA0102 Identify potential hazards and risks related to the job and list the appropriate responses • PA0103 Select tools, materials, equipment and lubricants • PA0104 Replace worn, damaged or defective components and parts • PA0105 Assemble, set and record gearbox component or part numbers and specifications (including floats) • PA0106 Lubricate components • PA0107 Conduct post-assembly activities 	<p><u>Applied Knowledge</u></p> <p>PM-08-PS02: Disassemble, clean and inspect gearboxes</p> <ul style="list-style-type: none"> • AK0201 Procedures to disassemble, clean and inspect gearboxes • AK0202 Original Equipment Manufacturer gearbox specifications • AK0203 Lubricants, gasket material • AK0204 Gearbox components and component numbers • AK0205 Signs and causes of wear, damage, failure and defects in components • AK0206 Safe handling and storage of components <p>PM-04-PS01: Replace gearbox components and assemble gearboxes</p> <ul style="list-style-type: none"> • AK0101 Procedures to replace and assemble a gearbox • AK0102 Original Equipment Manufacturer gearbox specifications • AK0103 Types and applications of gearboxes • AK0104 Types and applications of lubricants • AK0105 Gearbox lubrication procedures • AK0106 Safe handling and storage of components 	<p>procedures, lock out, tagging and site preparation procedures during routine maintenance</p> <ul style="list-style-type: none"> • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / conduct under supervision (WA0203) / conduct (WA0303) a range of routine maintenance tasks of varying complexity (gearboxes) • WA0104, WA0204, WA0304: The experience must include routine maintenance of gearboxes <p>WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts (gearboxes)</p> <ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods.
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<p>PM-05-PS01: Do fault-finding on gearboxes <i>Given a scenario or a simulated faulty gearbox installation, practical assignment, tools, diagnostic equipment, personal protective equipment and specification</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0101 Identify potential hazards and risks related to the job and list the appropriate responses • PA0102 Inspect or assess gearbox condition using senses • PA0103 Inspect or assess gearbox condition using diagnostic equipment • PA0104 Identify possible faults • PA0105 Determine corrective actions and options for dealing with identified faults • PA0106 Report gearbox faults or defects • PA0107 Conduct post-fault-finding activities • Perform housekeeping as per industry standards • Complete a report referencing remedial action to completion of tasks <p>PM-06-PS 01: Repair gearboxes <i>Given faulty gearboxes, replacement components, parts and lubricants, diagnostic information, sequence of work, specifications, tools and personal protective equipment</i></p> <p>The apprentice must be able to:</p>	<p>PM-05-PS01: Do fault-finding on a gearbox</p> <ul style="list-style-type: none"> • AK0101 Procedures to do fault-finding on a gearbox • AK0102 Gearbox Original Equipment Manufacturer (OEM) specifications • AK0103 Signs, symptoms and causes of gearbox faults • AK0104 Types of gearbox faults • AK0105 Possible corrective actions and options to repair gearbox faults <p>PM-06-PS 01: Repair gearboxes</p> <ul style="list-style-type: none"> • AK0101 Procedures for repairing gearboxes • AK0102 Safety practices and procedures • AK0103 Gearbox disassembly and assembly procedures • AK0104 Gearbox component replacement procedures • AK0105 Lubricants, seals and parts specifications and part numbers • AK0106 Use and care of tools and equipment • AK0107 Post repair activities <p>PM-08-PS01: Overhaul a gearbox</p> <ul style="list-style-type: none"> • AK080101 Manufacture specifications • AK080102 Overhauling procedures 	<ul style="list-style-type: none"> • Ensure all safety guards are replaced • Listen to abnormal noise on gearboxes and drives and report findings • Feel for abnormal vibration • Monitor for excessive heat • Inspect for missing components • Perform housekeeping as per prescribed industry standard <p>FAULT FINDING AND REPAIRS</p> <p>WM-04-WE01 For a period of two weeks, assist an experienced artisan repairing faults on mechanical sub-assemblies and machines</p> <p>WM-04-WE02 Perform repairs on mechanical sub-assemblies and machines</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Observe (WA0101) / perform under supervision (WA0201) / perform (WA0301) inspection processes, safety procedures, lock out, tagging and site preparation procedures • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / perform under supervision (WA0203) / perform (WA0303) a range of mechanical fault-finding, repairs,
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<ul style="list-style-type: none"> • PA0101 Read and interpret the practical assignments on specific repairs required • PA0102 Read and interpret the standard repair specifications and quality requirements from the manufacturer • PA0103 Identify gearbox components, parts, seals, lubricants and specifications of these that must be available for repair • PA0104 Plan the sequence of work to repair the gearbox • PA0105 Identify potential hazards and risks related to the job and list the appropriate responses • PA0106 Identify, select and use the required hand tools, power tools and equipment • PA0107 Disassemble the gearbox following the specified procedure • PA0108 Inspect components and parts and confirm required repairs • PA0109 Replace components or parts following the specified procedure • PA0110 Reassemble the gearbox following the specified procedure • PA0111 Check and confirm that repairs have resolved the problem or fault • PA0112 Conduct post repair activities <p>PM-08-PS01: Overhaul a gearbox <i>Given a used gearbox with worn components, tools, access to everything need to overhaul a gearbox, personal protective equipment, specifications,</i></p>		<p>installation and commissioning tasks (gearboxes)</p> <ul style="list-style-type: none"> • WA0104, WA0204, WA0304: The experience must include a variety of breakdowns on gearboxes <p>WM-04-WE04 Perform repairs on mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts</p> <ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods • Perform housekeeping as per industry standards <p><u>OVERHAULING (gearboxes)</u> WM-05-WE01: For a period of two weeks, assist an experienced artisan overhauling mechanical sub-assemblies and machines WM-05-WE02: Overhaul a range mechanical machines and sub-assemblies under supervision WM-05-WE03: Overhaul a range mechanical machines and sub-assemblies autonomously</p>
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<p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA080101 Identify and select specific tools, equipment and materials required for the overhaul process • PA080102 Identify potential hazards and risks related to the job and list the appropriate responses • PA080103 Disassemble the gearbox and prepare the components for inspection • PA080104 Inspect the components and draw up a material and replacement parts list • PA080105 Replace all worn parts to specification • PA080106 Assemble and restore the gearbox to conform to with the service tolerances specified in the manufacturer specifications • PA080107 Perform post overhauling activities 		<ul style="list-style-type: none"> • Observe (WA0101) / perform under supervision (WA0201) / perform (WA0301) overhaul planning processes and pre-overhauling inspection procedures • Observe and assist with (WA0103) / perform under supervision (WA0203) / perform (WA0303) a range of overhauling tasks • WA0103 The experience must include a variety of overhauling projects on gearboxes <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications
ASSESSMENT CRITERIA		
<p>PM-08-PS02: Disassemble, clean and inspect gearboxes</p> <ul style="list-style-type: none"> • IAC0201 Procedures to disassemble, clean and inspect a gearbox are explained • IAC0202 A gearbox is disassembled, cleaned and inspected according to 	<p>KM-02-KT06: Mechanical working principles, types and applications of reduction gearboxes</p> <ul style="list-style-type: none"> • IAC0601 Types of gearboxes are identified and described • IAC0602 Components of gearboxes are identified and described 	<p>Supporting Evidence</p> <p><u>ROUTINE MAINTENANCE</u> WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on</p>

<p>procedure</p> <ul style="list-style-type: none"> • IAC0203 Risks and hazards are identified and responded to in a responsible manner • IAC0204 Gearbox component or part numbers are recorded correctly before and during disassembly • IAC0205 All worn, damaged and defective components are identified correctly • IAC0206 Gearbox types and Original Equipment Manufacturer specifications are explained • IAC0207 Signs and causes of worn, damaged and defective components are explained <p>PM-04-PS01: Replace gearbox components and assemble gearboxes</p> <ul style="list-style-type: none"> • IAC0101 Procedures to replace gearbox components and assemble a gearbox are explained • IAC0102 Gearbox components are replaced according to procedures • IAC0103 A gearbox is assembled according to procedure and Original Equipment Manufacturer specifications • IAC0104 Risks and hazards are identified and responded to in a responsible manner <p>PM-05-PS01 Do fault-finding on a gearbox</p> <ul style="list-style-type: none"> • IAC0101 Defects or faults on gearboxes are identified correctly 	<ul style="list-style-type: none"> • IAC0603 Functions and working principles of gearboxes are described • IAC0604 Removal and installation procedures for gearboxes are described • IAC0605 Safety precautions pertaining to gearboxes are explained <p>KM-02-KT13: Diagnostic techniques</p> <ul style="list-style-type: none"> • IAC1301 Types of diagnostic equipment are identified and described • IAC1302 The various types of diagnostic techniques are described • IAC1303 The sequence involved in a diagnostic procedure or technique is explained • IAC1304 Safety precautions pertaining to diagnostic equipment are explained 	<p>mechanical sub-assemblies and machines</p> <p>WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision</p> <p>WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p> <p>WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records <p><u>FAULT FINDING AND REPAIRS</u></p> <p>WM-04-WE01 For a period of two weeks, assist an experienced artisan repairing faults on mechanical sub-assemblies and machines</p> <p>WM-04-WE02 Perform repairs on mechanical sub-assemblies and machines</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <p>WM-04-WE04 Perform repairs on mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts</p>
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<ul style="list-style-type: none"> • IAC0102 Corrective actions and options are explained correctly and motivated • IAC0103 A systematic fault-finding process is followed • IAC0104 Risks and hazards are identified and responded to in a responsible manner <p>PM-06-PS 01: Repair gearboxes</p> <ul style="list-style-type: none"> • IAC0101 Instructions and repair specifications are interpreted correctly • IAC0102 Gearbox components and specifications are identified correctly • IAC0103 Gearbox is disassembled and reassembled correctly • IAC0104 Faulty components are identified and replaced correctly • IAC0105 Sequences to repair gearbox are followed correctly • IAC0106 Tools and equipment are identified and used correctly • IAC0107 Post repair activities are performed correctly • IAC0108 Safety requirements are met <p>PM-08-PS01: Overhaul a gearbox</p> <ul style="list-style-type: none"> • Safety requirements are met • Overhauling specifications and quality requirements are explained accurately • Tools, equipment, materials and parts are identified and described correctly • The sequence of activities to overhaul the gearbox is adhered to • The final product meets service 		<ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records <p><u>OVERHAULING</u></p> <p>WM-05-WE01: For a period of two weeks, assist an experienced artisan overhauling mechanical sub-assemblies and machines</p> <p>WM-05-WE02: Overhaul a range mechanical machines and sub-assemblies under supervision</p> <p>WM-05-WE03: Overhaul a range mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio
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tolerances specified in the manufacturer specifications		
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Internal Assessment to be performed

- Internal knowledge test of a minimum of 15 questions (30 min) and the competency will be at 80%
- Practical exercise of 180min covering all items mentioned above
 - No injury or unsafe act had occurred
 - Shims neat and square to the base
 - Base bolts torque to specifications
 - Adjusting bolts must be loose
 - Dismantle a worm-wheel type reduction gearbox.
 - Assemble a worm-wheel type gearbox.
 - Identify the following types of fits on shafts and hole basis - clearance, transition, interference.
 - Fit seal and packing to mechanical components gearboxes, etc.
 - The damage and/or wear to the parts must be correctly inspected. The gearbox inspection sheet completed, all damaged and/or worn parts recorded
 - The worm wheel must be adjusted so that the tooth contact area conforms to the recommended pattern (Contact must be between 65% and 70%)
 - The oil scraper on the worm wheel must have a clearance of between 0.25mm and 0.38mm or to specifications and set at 60°
 - Oil seals must be removed and fitted in the bearing covers without damaging them
 - The end play on the shafts must be measured, recorded and set according to manufacturer's specifications
 - The worm wheel must turn freely when rotating the worm shaft by hand at the input side
 - There must be no damage to equipment
 - Measure run-out
 - Inspect bearings and record all findings
 - The damage and/or wear to the parts must be correctly inspected. The gearbox inspection sheet completed, all damaged and/or worn parts recorded
 - Oil seals must be removed and fitted in the bearing covers without damaging them
 - All safety aspects adhered to
 - No damage to equipment
 - Level of competence required: 80%; and safety aspects: 100%

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of tolerance and Fits, lubrications, torque settings and bearing index sheet and gearboxes
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- CDs and videos procedures will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles
- Reduction Gearboxes,
- Tools including but not limited to: torque wrench, Socket set, Spanner set, bearing replacement equipment, shims, feeler gauge, Mallet, DTI and lifting equipment

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>H2</h1>
		Curriculum code: 653303000		
Learning area title: Perform work activities on gearboxes and drives	Total hours	SDP	WP	
		224	224	
Work situation title: Perform routine maintenance, fault finding, repair and alignment on drives	Total hours	80	80	
Work scenario: Dudu is called to a breakdown on a settling dam. On arrival he sees that the electrical motor is turning but the dam is overfull. He must determine, why the system failed to empty the dam and repair it				
Prerequisite learning: Year 1, H1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-03-PS06: Disassemble, clean and inspect drives <i>Given a selection of various types of direct and indirect drive, relevant tools, personal protective equipment, specifications, cleaning materials and solvents</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA0601 Plan and prepare workplace for disassembling direct and indirect drives PA0602 Identify potential hazards and risks related to the job and list the appropriate responses PA0603 Select tools and cleaning materials PA0604 Disassemble and record direct and indirect drive components or parts' numbers and specifications PA0605 Clean components of direct and indirect drives PA0606 Visually inspect component 	<p>Knowledge of:</p> <p>KM-02-KT04: Types and application of drives</p> <ul style="list-style-type: none"> KT0401 Drives (direct and indirect) KT0402 Terminology of drives KT0403 Functions and working principles of drives <p>KM-02-KT13: Diagnostic techniques</p> <ul style="list-style-type: none"> KT1301 Diagnostic equipment KT1302 Diagnostic techniques KT1303 Diagnostic testing <p><u>Applied Knowledge</u></p> <p>PM-03-PS06: Disassemble, clean and inspect drives</p> <ul style="list-style-type: none"> AK0601 Procedures to disassemble, clean and inspect direct and indirect drives AK0602 Original Equipment Manufacturer 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p><u>ROUTINE MAINTENANCE</u> WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> Observe (WA0101) / conduct under supervision (WA0201) / conduct (WA0301) inspection processes, safety procedures, lock out, tagging and site 	

<p>condition (wear, damage, defect, failure) according to Original Equipment Manufacturer specifications</p> <ul style="list-style-type: none"> • PA0607 Conduct post-disassembling activities • Align drives to 0.05mm • Apply tension according to calculations <p>PM-05-PS05: Do fault-finding on drives</p> <p><i>Given practical assignments, faulty direct and indirect drives, tools, diagnostic equipment, personal protective equipment and specifications</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0501 Identify potential hazards and risks related to the job and list the appropriate responses • PA0502 Visually inspect or assess condition of direct and indirect drives • PA0503 Identify possible faults • PA0504 Determine corrective actions and options for dealing with identified faults • PA0505 Report faults or defects on direct and indirect drives • PA0506 Conduct post-diagnosis and fault-finding activities • Perform housekeeping as per prescribed industry standard <p>PM-04-PS05: Replace drive components and assemble drives</p> <p><i>Given a selection of various types of direct and indirect drives, relevant tools, personal</i></p>	<p>direct and indirect drive specifications</p> <ul style="list-style-type: none"> • AK0603 Components of direct and indirect drives • AK0604 Signs and causes of wear, damage, failure and defects in components • AK0605 Safe handling and storage of components <p>PM-10-PS05: Do fault-finding on drives</p> <ul style="list-style-type: none"> • AK0501 Procedures to diagnose problems with direct and indirect drives • AK0502 Procedures to do fault-finding on direct and indirect drives • AK0503 Original Equipment Manufacturer specifications for direct and indirect drives • AK0504 Signs, symptoms and causes of faults on drives • AK0505 Types of drive faults • AK0506 Possible corrective actions and options to repair faults <p>PM-04-PS05: Replace drive components and assemble drives</p> <ul style="list-style-type: none"> • AK0501 Procedures to replace components of direct and indirect drives and assembly of direct and indirect drives • AK0502 Direct and indirect drive Original Equipment Manufacturer specifications • AK0503 Types and applications of direct and indirect drives 	<p>preparation procedures during routine maintenance</p> <ul style="list-style-type: none"> • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / conduct under supervision (WA0203) / conduct (WA0303) a range of routine maintenance tasks of varying complexity • WA0104, WA0204, WA0304: The experience must include routine maintenance on drives <p>WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts (drives)</p> <ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods. • Ensure all safety guards are replaced • Listen to abnormal noise on gearboxes and drives and report findings
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<p><i>protective equipment, specifications and materials</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0501 Plan and prepare for replacement of direct and indirect drive components and assembly of direct and indirect drives • PA0502 Identify potential hazards and risks related to the job and list the appropriate responses • PA0503 Select tools, materials and equipment • PA0504 Replace worn, damaged or defective components and parts • PA0505 Assemble and record direct and indirect drive component or part numbers and specifications • PA0506 Check and lubricate drives • PA0507 Conduct post-assembly activities <p>PM-06-PS 05: Repair drives <i>Given faulty drives, replacement components, lubricants, diagnostic information, sequence of work, specifications, tools and personal protective equipment,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0501 Read and interpret the practical assignments on specific repairs required • PA0502 Read and interpret the standard repair specifications and quality 	<p>PM-06-PS 05: Repair drives</p> <ul style="list-style-type: none"> • AK0501 Procedures for repairing drives • AK0502 Safety practices and procedures • AK0503 Drive disassembly and assembly procedures • AK0504 Drive component replacement procedures • AK0505 Lubricants, seals and parts specifications and part numbers • AK0506 Use and care of tools and equipment • AK0507 Post repair activities 	<ul style="list-style-type: none"> • Feel for abnormal vibration • Monitor for excessive heat • Inspect for missing components • Perform housekeeping as per prescribed industry standard <p><u>FAULT FINDING AND REPAIRS</u></p> <p>WM-04-WE01 For a period of two weeks, assist an experienced artisan repairing faults on mechanical sub-assemblies and machines</p> <p>WM-04-WE02 Perform repairs on mechanical sub-assemblies and machines</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Observe (WA0101) / perform under supervision (WA0201) / perform (WA0301) inspection processes, safety procedures, lock out, tagging and site preparation procedures • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / perform under supervision (WA0203) / perform (WA0303) a range of mechanical fault-finding, repairs, installation and commissioning tasks (drives) • WA0104, WA0204, WA0304: The experience must include a variety of breakdowns on drives
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<p>requirements from the manufacturer</p> <ul style="list-style-type: none"> • PA0503 Identify components, parts, seals, lubricants and specifications of these that must be available for repair • PA0504 Plan the sequence of work to repair the drive • PA0505 Identify potential hazards and risks related to the job and list the appropriate responses • PA0506 Identify, select and use the required hand tools, power tools and equipment • PA0507 Disassemble the drive following the specified procedure • PA0508 Inspect components and parts and confirm required repairs • PA0509 Replace components or parts following the specified procedure • PA0510 Reassemble the drive following the specified procedure • PA0511 Check and confirm that repairs have resolved the problem or fault • PA0512 Conduct post-repair activities 		<p>WM-04-WE04 Perform repairs on mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts (drives)</p> <ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods. • Perform housekeeping as per industry standards <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications
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ASSESSMENT CRITERIA		
<p>PM-03-PS06: Disassemble, clean and inspect drives</p> <ul style="list-style-type: none"> • IAC0601 Procedures to disassemble, clean and inspect direct and indirect drives are explained • IAC0602 Direct and indirect drives are disassembled, cleaned and inspected according to procedure • IAC0603 Risks and hazards are identified and responded to in a responsible manner • IAC0604 Components or parts numbers on direct and indirect drives are recorded correctly before and during disassembly • IAC0605 All worn, damaged and defective components are identified correctly • IAC0606 Direct and indirect drives types and Original Equipment Manufacturer specifications are explained <p>PM-05-PS05: Do fault-finding on drives</p> <ul style="list-style-type: none"> • IAC0501 Defects or faults on direct and indirect drives are identified correctly • IAC0502 Corrective actions and options are explained correctly and motivated • IAC0503 A systematic fault-finding process is followed • IAC0504 Risks and hazards are identified and responded to in a responsible manner 	<p>KM-02-KT04: Types and application of drives</p> <ul style="list-style-type: none"> • IAC0401 Classification and types of drives are identified and discussed • IAC0402 Application of drives is discussed • IAC0403 Components of drives are identified and discussed • IAC0404 Functions and working principles of drives are described • IAC0405 Removal and installation procedures for drives are described • IAC0406 Safety precautions pertaining to drives are explained <p>KM-02-KT13: Diagnostic techniques</p> <ul style="list-style-type: none"> • IAC1301 Types of diagnostic equipment are identified and described • IAC1302 The various types of diagnostic techniques are described • IAC1303 The sequence involved in a diagnostic procedure or technique is explained • IAC1304 Safety precautions pertaining to diagnostic equipment are explained 	<p>Supporting Evidence</p> <p><u>ROUTINE MAINTENANCE</u> WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records <p><u>FAULT FINDING AND REPAIRS</u> WM-04-WE01 For a period of two weeks, assist an experienced artisan repairing faults on mechanical sub-assemblies and machines WM-04-WE02 Perform repairs on mechanical sub-assemblies and machines</p>

<p>PM-04-PS05: Replace drive components and assemble drives</p> <ul style="list-style-type: none"> • IAC0501 Procedures to replace direct and indirect drive components and assemble direct and indirect drives are explained • IAC0502 Direct and indirect drive components are replaced according to procedures • IAC0503 Direct and indirect drives are assembled according to procedure and Original Equipment Manufacturer specifications • IAC0504 Risks and hazards are identified and responded to in a responsible manner <p>PM-06-PS 05: Repair drives</p> <ul style="list-style-type: none"> • IAC0501 Instructions and repair specifications are interpreted correctly • IAC0502 Drive components and specifications are identified correctly • IAC0503 The drive is disassembled and reassembled correctly • IAC0504 Faulty components are identified and replaced correctly 		<p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <p>WM-04-WE04 Perform repairs on mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 15 questions (30 min) and the competency will be at 80% • Practical exercise of 90min covering all items mentioned above (V-belt, Chain Drive, Couplings(Tyre)) <ul style="list-style-type: none"> ○ No injury or unsafe act had occurred ○ Identify the following types of drives - belt, gear, and chain. ○ Identify A, B and C class V-belts. 		

- Maintain belt drives.
- Maintain gear drives.
- Maintain chain drives
- Tension and deflection according to chart or calculations
- 16mm per meter span (Use back of instruction sheet for calculations)
- Master link must be in the correct direction
- Chain tension adjusted correctly
- Lubrication of chain drives
- Horizontal and vertical alignment of driver and driven pulley within 0.5mm
- Chain Tension and deflection according to chart or calculations 16mm per meter span (Use back of instruction sheet for calculations)
- Shims neat and square to the base
- Base bolts torque to specifications
- Align driver to driven within ± 0.1 mm horizontally
- Align driver to driven within ± 0.1 mm vertically
- Align tension sprocket to main sprockets to within ± 0.1 mm
- Master link must be in the correct direction
- Adjusting bolts must be loose
- All safety aspects adhered to according company policies
- No damage to equipment

Learning resources for teaching

- Learning material covering Knowledge and Practical Skills Modules
- Samples (and charts) of tolerance and Fits, lubrications, v-belts, chain drives, masterlink, gearboxes
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles
- V-belt alignment tools, belt tension gauge, hand tools, measuring equipment, straight edge, single v-belt simulation, double v-belt simulation, variety of shims, Pulley gauge
- Chain drives, hand tools, measuring equipment, straight edge, single chain simulation, double chain simulation, variety of shims, tensioner pulley, variety of master links

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>H3</h1>
		Curriculum code: 653303000		
Learning area title: Perform work activities on gearboxes and drives	Total hours	SDP	WP	
		224	224	
Work situation title: Install, align and commission gearboxes to specification	Total hours	24	24	
Work scenario: Lefa is tasked with the instalment of the new conveyer belt on the new plant. One of the tasks is the installation of the drives to the gearbox. He has to ensure the correct chain pulleys are used and also the tension of the chains. He also ensures that all the bolts are correctly torqued according to specifications				
Prerequisite learning: H1-H2				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-07-PS01 Install and commission gearboxes <i>Given practical assignments, a repaired or overhauled gearbox, tools, personal protective equipment, specifications</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0101 Read and interpret the installation and commissioning specifications and quality requirements • PA0102 Identify and select specific tools, equipment and materials required for the installation and commissioning process • PA0103 Plan the sequences for installation and commissioning • PA0104 Identify potential hazards and risks related to the job and list the appropriate responses • PA0105 Prepare the work area for installation of the gearbox • PA0106 Install gearbox to specifications 	<p>Knowledge of:</p> <p>KM-02-KT06: Mechanical working principles, types and applications of reduction gearboxes</p> <ul style="list-style-type: none"> • KT0601 Gearboxes (single reduction, double reduction, variable speed) • KT0601 Terminology of gearboxes • KT0601 Functions and working principles of gearboxes • KT0601 Removal and installation procedures for gearboxes <p>Applied Knowledge</p> <p>PM-07-PS01: Install and commission gearboxes</p> <ul style="list-style-type: none"> • AK0101 Gearbox installation and commissioning procedures and specifications 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously [Focus: Install, align and commission]</p> <ul style="list-style-type: none"> • WA0301 Perform inspection processes safety procedures, lock out, tagging and site preparation procedures • WA0302 Interact with production personnel and report • WA0303 Perform installation and commissioning tasks for gearboxes <ul style="list-style-type: none"> ○ Gather necessary technical information, develop installation and commissioning plan, list and obtain required parts & materials ○ Install as per manufacturers' and workplace specifications ○ Conduct post-installation inspection 	

<ul style="list-style-type: none"> • PA0107 Use tools and equipment correctly • PA0108 Follow the correct installation procedures and sequence • PA0109 Check gearbox installation by performing a systematic inspection of all the critical control points • PA0110 Commission the gearbox by performing a final inspection and performance test • PA0111 Perform post installation and commissioning activities • Perform Housekeeping as per industry standards • Performance assessment report for completion of work situation 	<ul style="list-style-type: none"> • AK0102 Use of and care for tools and equipment 	<p>and functionality tests and commission the installations</p> <ul style="list-style-type: none"> ○ Complete all relevant documentation • Perform Housekeeping as per industry standards <p>Contextualised Workplace Knowledge</p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling & storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records <p>Original Equipment Manufacturer manuals and specifications</p>
ASSESSMENT CRITERIA		
<p>PM-07-PS01: Install and commission gearboxes</p> <ul style="list-style-type: none"> • Installation is performed to requirements and specifications • Commissioning is performed to requirements • Quality requirements are met • Tools and equipment are used appropriately and correctly • Safety requirements are met 	<p>KM-02-KT06 Mechanical working principles, types and applications of reduction gearboxes</p> <ul style="list-style-type: none"> • Types of gearboxes are identified and described • Components of gearboxes are identified and described • Functions and working principles of gearboxes are described • Removal and installation procedures for gearboxes are described • Safety precautions pertaining to gearboxes are explained 	<p>Supporting Evidence</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • SE0301 Signed-off job cards • SE0302 Non-conformance reports • SE0303 Workplace logbook or portfolio • SE0304 Equipment downtime records <ul style="list-style-type: none"> • Installation documentation

Internal Assessment to be performed

- Practical exercise of 2 Hours length
 - No Injuries to self/co-worker and the environment or damage to equipment
 - Tension and deflection according to chart or calculations 16mm per meter span (Use back of instruction sheet for calculations)
 - Shims neat and square to the base
 - Adjusting bolts must be loose
 - Base bolts torque to specifications
 - Align driver to driven within $\pm 0.5\text{mm}$ horizontally
 - Align driver to driven within $\pm 0.5\text{mm}$ vertically
 - Align tension sprocket to main sprockets to within $\pm 0.1\text{mm}$
 - Master link must be in the correct direction
 - Chain tension adjusted correctly
 - Shims neat and square to the base
 - Adjusting bolts must be loose
 - Identify the following types of fits on shafts and hole basis - clearance, transition, interference.
 - Fit seal and packing to mechanical components gearboxes, etc.
 - The damage and/or wear to the parts must be correctly inspected. The gearbox inspection sheet completed, all damaged and/or worn parts recorded
 - Mark sheet requirements
 - Level of competence required: 80%

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of tolerance and Fits, lubrications, masterlinks and gearboxes
- Safe Operating Procedure and Safe Working Procedure; Charts of risk assessment procedure and safety measures
- CDs and videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment; Overalls; Safety Boots; Safety Goggles
- Hand tools, measuring equipment, straight edge, single chain simulation, double chain simulation, variety of shims, tensioner pulley, variety of master links
- Gearboxes reduction, hand tools, measuring tools, spirit level

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>H4</h1>
		Curriculum code: 653303000		
Learning area title: Perform work activities on gearboxes and drives	Total hours	SDP	WP	
		224	224	
Work situation title: Install, align and commission drives to specification	Total hours	40	40	
Work scenario: Lefa is tasked with the instalment of the new conveyer belt on the new plant. One of the tasks is the installation of the drives to the gearbox. He has to ensure the correct chain pulleys are used and also the tension of the chains. He also ensures that all the bolts are correctly torqued according to specifications.				
Prerequisite learning: H2-H3				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-07-PS05 Install and commission drives <i>Given practical assignments, a repaired drive, tools, personal protective equipment, specifications</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0501 Read and interpret the installation and commissioning specifications and quality requirements • PA0502 Identify and select specific tools, equipment and materials required for the installation and commissioning process • PA0503 Plan the sequences for installation and commissioning • PA0504 Identify potential hazards and risks related to the job and list the appropriate responses • PA0505 Prepare the work area for installation of the drive • PA0506 Install the drive to specifications 	<p>Knowledge of:</p> <p>KM-02-KT04 Types and application of drives</p> <ul style="list-style-type: none"> • KT0401 Drives (direct and indirect) • KT0402 Terminology of drives • KT0403 Functions and working principle of drives <p><u>Applied Knowledge</u></p> <p>PM-07-PS05 Install and commission drives</p> <ul style="list-style-type: none"> • AK0501 Drive installation and commissioning procedures and specifications • AK0502 Use of and care for tools and equipment 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously [Focus: Install, align and commission]</p> <ul style="list-style-type: none"> • WA0301 Perform inspection processes safety procedures, lock out, tagging and site preparation procedures • WA0302 Interact with production personnel and report • WA0303 Perform installation and commissioning tasks for drives <ul style="list-style-type: none"> ○ Gather necessary technical information, develop installation and commissioning plan, list and obtain required parts & materials ○ Install as per manufacturers' and workplace specifications ○ Conduct post-installation inspection 	

<ul style="list-style-type: none"> • PA0507 Use tools and equipment correctly • PA0508 Follow the correct installation procedures and sequence • PA0509 Check drive installation by performing a systematic inspection of all the critical control points • PA0510 Commission the drive by performing a final inspection and performance test • PA0511 Perform post installation and commissioning activities • Perform Housekeeping as per industry standards 		<p>and functionality tests and commission the installations</p> <ul style="list-style-type: none"> ○ Complete all relevant documentation • Perform Housekeeping as per industry standards <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling & storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications
ASSESSMENT CRITERIA		
<p>PM-07-PS05 Install and commission drives</p> <ul style="list-style-type: none"> • Installation is performed to requirements and specifications • Commissioning is performed to requirements • Quality requirements are met • Tools and equipment are used appropriately and correctly • Safety requirements are met 	<p>KM-02-KT04 Types and application of drives</p> <ul style="list-style-type: none"> • Classification and types of drives are identified and discussed • Application of drives is discussed • Components of drives are identified and discussed • Functions and working principles of drives are described • Removal and installation procedures for drives are described • Safety precautions pertaining to drives are explained 	<p>Supporting Evidence</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • SE0301 Signed-off job cards • SE0302 Non-conformance reports • SE0303 Workplace logbook or portfolio • SE0304 Equipment downtime records • Installation documentation

Internal Assessment to be performed

- Practical exercise of 2 hours length
 - No injury or unsafe act had occurred
 - No Injuries to self/co-worker and the environment or damage to equipment
 - Identify the following types of drives - belt, gear, and chain.
 - Identify A, B and C class V-belts.
 - Install and align a single belt-drive.
 - Install and align match-set belt drives.
 - Install and align chain drives.
 - Install jockey on V-belt and chain drive units.
 - Horizontal and vertical alignment of driver and driven pulley within 0.5mm
 - Tension and deflection according to chart or calculations 16mm per meter span (Use back of instruction sheet for calculations)
 - Shims neat and square to the base
 - Adjusting bolts must be loose
 - Base bolts torque to specifications
 - Align driver to driven within ± 0.5 mm horizontally
 - Align driver to driven within ± 0.5 mm vertically
 - Align tension sprocket to main sprockets to within ± 0.1 mm
 - Master link must be in the correct direction
 - Chain tension adjusted correctly
 - Shims neat and square to the base
 - Adjusting bolts must be loose
 - Identify the following types of fits on shafts and hole basis - clearance, transition, interference.
 - Fit seal and packing to mechanical components gearboxes, etc.
 - The damage and/or wear to the parts must be correctly inspected. The gearbox inspection sheet completed, all damaged and/or worn parts recorded
 - Mark sheet requirements
 - Level of competence required: 80%

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of tolerance and Fits, lubrications, v-belts, chain drives, masterlinks and gearboxes

- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- CDs and videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment; Overalls; Safety Boots; Safety Goggles
- V-belt alignment tools, fenner, hand tools, measuring equipment, straight edge, single v-belt simulation, double v-belt simulation, variety of shims
- Chain drives, hand tools, measuring equipment, straight edge, single chain simulation, double chain simulation, variety of shims, tensioner pulley, variety of master links
- Gearboxes reduction, hand tools, measuring tools, spirit level

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>H5</h1>				
		Curriculum code: 653303000						
Learning area title: Perform work activities on gearboxes and drives		Total hours	<table border="1"> <tr> <td>SDP</td> <td>WP</td> </tr> <tr> <td>224</td> <td>224</td> </tr> </table>		SDP	WP	224	224
SDP	WP							
224	224							
Work situation title: Perform laser alignment on drives and gearboxes (ELECTIVE)		Total hours	<table border="1"> <tr> <td>40</td> <td>40</td> </tr> </table>	40	40			
40	40							
Work scenario: Ben has been requested to replace the V-belts on the cooling fan. He has to select a set and calculate and adjust the tension correctly. He must then realign the two pulleys using a laser alignment equipment.								
Prerequisite learning: Year 2								
INTEGRATED LEARNING CONTENT								
Practical skills modules (PM)	Knowledge modules (KM)	Work experience modules (WM)						
<p><i>QCTO none</i> <i>Given various forms of drives & gearboxes, materials and hand tools as well as laser alignment equipment</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Install and align a single belt-drive. • Install and align match-set belt drives. • Install and align chain drives • Install jockey on V-belt and chain drive units. • Horizontal and vertical alignment of driver and driven pulley within 0.1mm • Tension and deflection according to chart or calculations 16mm per meter span (Use back of instruction sheet for calculations) • Shims neat and square to the base • Adjusting bolts must be loose • Base bolts torque to specifications • Align driver to driven within ± 0.1mm horizontally 	<p>Knowledge of:</p> <p>KM-02-KT04 Types and application of drives</p> <ul style="list-style-type: none"> • KT0401 Drives (direct and indirect) • KT0402 Terminology of drives • KT0403 Functions and working principle of drives • Calculations for the tension of drives e.g. v-belt and gearbox <p>KM-02-KT06 Mechanical working principles, types and applications of reduction gearboxes</p> <ul style="list-style-type: none"> • KT0601 Gearboxes (single reduction, double reduction, variable speed) • KT0601 Terminology of gearboxes • KT0601 Functions and working principles of gearboxes • KT0601 Removal and installation procedures for gearboxes • Laser alignment equipment 	<p><i>QCTO none</i></p> <p>The apprentice will be expected to gain practical experience and engage in the following work activities:</p> <ul style="list-style-type: none"> • Install and align a single belt-drive. • Install and align match-set belt drives. • Install and align chain drives... • Install jockey on V-belt and chain drive units. • Horizontal and vertical alignment of driver and driven pulley within 0.1mm • Tension and deflection according to chart or calculations 16mm per meter span (Use back of instruction sheet for calculations) • Shims neat and square to the base • Adjusting bolts must be loose • Base bolts torque to specifications • Align driver to driven within ± 0.1mm horizontally 						

<ul style="list-style-type: none"> Align driver to driven within ± 0.1mm vertically Align tension sprocket to main sprockets to within ± 0.1mm Master link must be in the correct direction Chain tension adjusted correctly Set up and use laser alignment equipment correctly Handling and storage correct Safety procedure followed for the laser alignment Ensuring the calibration is valid Record and use the results of the laser reading correctly Align a gearbox using couplings or drives Alignment to be within 0.05mm on couplings (RPM related) Perform Housekeeping as per industry standard 	<ul style="list-style-type: none"> Procedure of using a laser alignment equipment Techniques for laser aligning gearboxes and drives Safety precautions when performing laser alignment Tolerance chart Transmitter and receiver How to mount and set up and on which side the transmitter and receiver must be 	<ul style="list-style-type: none"> Align driver to driven within ± 0.1mm vertically Align tension sprocket to main sprockets to within ± 0.1mm Master link must be in the correct direction Chain tension adjusted correctly Shims neat and square to the base Adjusting bolts must be loose Set up and use a laser alignment equipment correctly Handling and storage correct Safety procedure followed for the laser alignment Ensuring the calibration is valid Record and use the results of the laser reading correctly Align a gearbox using couplings or drives Alignment to be within 0.05mm on couplings Perform housekeeping as per industry standards
ASSESSMENT CRITERIA		
<p>Laser Alignment of mechanical drives</p> <ul style="list-style-type: none"> Horizontal and vertical alignment of driver and driven pulley within 0.1mm Tension and deflection according to chart or calculations 16mm per meter span (Use back of instruction sheet for calculations) Shims neat and square to the base Adjusting bolts must be loose 	<p>KM-02-KT04 Types and application of drives</p> <ul style="list-style-type: none"> Classification and types of drives are identified and discussed Application of drives is discussed Components of drives are identified and discussed Functions and working principles of drives are described 	<p>Supporting Evidence:</p> <ul style="list-style-type: none"> Signed-off logbook/PoE

<ul style="list-style-type: none"> • Base bolts torque to specifications • Align tension sprocket to main sprockets to within $\pm 0.1\text{mm}$ • Master link must be in the correct direction • Chain tension adjusted correctly • Set up and use a laser alignment equipment correctly • Handling and storage correctly • Safety procedure followed for the laser alignment • Ensuring the calibration is valid • Record and use the results of the laser reading correctly • Alignment to be within 0.05mm on couplings (in accordance to RPM requirements) • Proper Housekeeping • Performance assessment report for completion of work situation 	<ul style="list-style-type: none"> • Removal and installation procedures for drives are described • Safety precautions pertaining to drives are explained • Calculation for the tension calculated correctly <p>KM-02-KT06 Mechanical working principles, types and applications of reduction gearboxes</p> <ul style="list-style-type: none"> • Types of gearboxes are identified and described • Components of gearboxes are identified and described • Functions and working principles of gearboxes are described • Removal and installation procedures for gearboxes are described • Safety precautions pertaining to gearboxes are explained 	
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 20 marks (30 min) and the competency will be at 80% • Practical exercise of 90min covering all above-mentioned items <ul style="list-style-type: none"> ○ Level of competency of 100% (critical) required for: <ul style="list-style-type: none"> ▪ Safety isolate, lockout and test for zero potential ▪ Setup of laser equipment (settings) • Level of competency of 80% required for: <ul style="list-style-type: none"> ▪ No Injuries to self/co-worker and the environment or damage to equipment ▪ Install and align a single belt-drive. ▪ Install and align match-set belt drives. ▪ Install and align chain drives... 		

- Install jockey on V-belt and chain drive units.
- Horizontal and vertical alignment of driver and driven pulley within 0.1mm
- Tension and deflection according to chart or calculations 16mm per meter span (Use back of instruction sheet for calculations)
- Shims neat and square to the base
- Adjusting bolts must be loose
- Base bolts torque to specifications
- Align tension sprocket to main sprockets to within ± 0.1 mm
- Master link must be in the correct direction
- Chain tension adjusted correctly
- Set up and use a laser alignment equipment correctly
- Handling and storage correct
- Safety procedure followed for the laser alignment
- Ensuring the calibration is valid
- Record and use the results of the laser reading correctly
- Align a gearbox using couplings or drives
- Alignment to be within 0.05mm on couplings (Correct according to RPM chart)
- All safety aspects adhered to according company policies

Learning resources for teaching

- Learning material
- Samples (and charts) of laser equipment, tolerances
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- CDs and videos

Tools, Equipment and Materials

- Personal Protective Equipment; e.g. Overalls; Safety Boots; Safety Goggles
- V-belt alignment tools,
- Belt tension gauge
- Straight edge
- Single v-belt simulation
- Double v-belt simulation

- Variety of shims
- Laser alignment equipment and mounting equipment
- Chain drives
- Measuring equipment
- Single chain simulation,
- Double chain simulation
- Tensioner pulley
- Verity of master links
- Gearboxes reduction
- Socket set
- Torque wrench
- Spanner set
- Allen Key set
- Tommy bar
- Engineering Square
- Tape measure
- Feeler gauge
- Rubber mallet
- Lockout equipment

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		11
		Curriculum code: 653303000		
Learning area title: Perform work activities on pumps for water systems and water related valves	Total hours	SDP	WP	
		112	112	
Work situation title: Perform routine maintenance fault finding, repair and reassembly activities on pumps for water systems	Total hours	40	40	
Work scenario: Jane is responsible for maintaining the pumps on a plant. She has to ensure that the pumps are functional and adjusted to specification.				
Prerequisite learning Year 1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-03-PS03: Disassemble, clean, inspect and assemble pumps <i>Given a selection of various types of pumps, relevant tools, personal protective equipment, specifications, cleaning materials and solvents,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA0301 Plan and prepare workplace for disassembling a pump PA0302 Identify potential hazards and risks related to the job and list the appropriate responses PA0303 Select tools and cleaning materials PA0304 Disassemble and record pump component or part numbers and specifications PA0305 Clean pump components PA0306 Visually inspect component condition (wear, damage, defect, failure) 	<p>Knowledge of:</p> <p>KM-02-KT05: Types and application of pumps</p> <ul style="list-style-type: none"> KT0501 Classification of pumps KT0502 Terminology of pumps KT0503 Functions and working principles of pumps Knowledge of all seals used in pumps Lubrication that should be used on mechanical seals Cuttings of glands packing according to angles Material Safety data sheet (MSDS) Understanding a maintenance schedule <p>Applied Knowledge</p> <p>PM-03-PS03: Disassemble, clean, inspect and assemble pumps</p> <ul style="list-style-type: none"> AK0301 Procedures to disassemble, 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p><u>ROUTINE MAINTENANCE</u></p> <p>WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines</p> <p>WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision</p> <p>WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> Observe (WA0101) / conduct under supervision (WA0201) / conduct (WA0301) inspection processes, safety procedures, lock out, tagging and site 	

<p>according to Original Equipment Manufacturer specifications</p> <ul style="list-style-type: none"> • PA0307 Conduct post-disassembling activities • Assemble according to OEM specifications <p>PM-05-PS02: Do fault-finding on pumps <i>Given practical assignments, faulty pumps, tools, diagnostic equipment, personal protective equipment and specifications,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0201 Identify potential hazards and risks related to the job and list the appropriate responses • PA0202 Visually inspect or assess pump condition • PA0203 Identify possible faults • PA0204 Determine corrective actions and options for dealing with identified faults • PA0205 Report pump faults or defects • PA0206 Conduct post-diagnosis and fault-finding activities <p>PM-04-PS02: Replace pump components and assemble pumps <i>Given a selection of various types of pump, relevant tools, personal protective equipment and specifications,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0201 Plan and prepare for replacement of pump components and assembly of a pump 	<p>clean and inspect pumps</p> <ul style="list-style-type: none"> • AK0302 Original Equipment Manufacturer pump specifications • AK0303 Pump components and component numbers • AK0304 Signs and causes of wear, damage, failure and defects in components • AK0305 Safe handling and storage of components <p>PM-05-PS02: Do fault-finding on pumps</p> <ul style="list-style-type: none"> • AK0201 Procedures to diagnose pump problems • AK0202 Procedures to do fault-finding on pumps • AK0203 Original Equipment Manufacturer (OEM) specifications for pumps • AK0204 Signs, symptoms and causes of faults • AK0205 Types of pump faults • AK0206 Possible corrective actions and options to repair faults <p>PM-04-PS02: Replace pump components and assemble pumps</p> <ul style="list-style-type: none"> • AK0201 Procedures to replace and assemble a pump • AK0202 Original Equipment Manufacturer pump specifications • AK0203 Types and applications of pumps • AK0204 Types and applications of lubricants 	<p>preparation procedures during routine maintenance</p> <ul style="list-style-type: none"> • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / conduct under supervision (WA0203) / conduct (WA0303) a range of routine maintenance tasks of varying complexity • WA0104, WA0204, WA0304: The experience must include routine maintenance on pumps <p>WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts (pumps)</p> <ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods.
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<ul style="list-style-type: none"> • PA0202 Identify potential hazards and risks related to the job and list the appropriate responses • PA0203 Select tools, materials, equipment and lubricants • PA0204 Replace worn, damaged or defective components and parts • PA0205 Assemble, set and record pump component or part numbers and specifications • PA0206 Check and lubricate a pump • PA0207 Conduct post-assembly activities <p>PM-06-PS 02: Repair pumps <i>Given faulty pumps, replacement components, lubricants, diagnostic information, sequence of work, specifications, tools and personal protective equipment,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0201 Read and interpret the practical assignments on specific repairs required • PA0202 Read and interpret the standard repair specifications and quality requirements from the manufacturer • PA0203 Identify components, parts, seals, lubricants and specifications of these that must be available for repair • PA0204 Plan the sequence of work to repair the pump • PA0205 Identify potential hazards and risks related to the job and list the appropriate responses 	<ul style="list-style-type: none"> • AK0205 Pump lubrication procedures • AK0206 Pump components and applications <p>PM-06-PS 02: Repair pumps</p> <ul style="list-style-type: none"> • AK0201 Procedures for repairing pumps • AK0202 Safety practices and procedures • AK0203 Pump disassembly and assembly procedures • AK0204 Pump component replacement procedures • AK0205 Lubricants, seals and parts specifications and part numbers • AK0206 Use and care of tools and equipment • AK0207 Post repair activities <p>PM-08-PS02: Overhaul a pump</p> <ul style="list-style-type: none"> • AK080201 Manufacture specifications • AK080202 Overhauling procedures 	<ul style="list-style-type: none"> • Perform Housekeeping as per industry standards <p><u>FAULT FINDING AND REPAIRS</u></p> <p>WM-04-WE01 For a period of two weeks, assist an experienced artisan repairing faults on mechanical sub-assemblies and machines</p> <p>WM-04-WE02 Perform repairs on mechanical sub-assemblies and machines</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Observe (WA0101) / perform under supervision (WA0201) / perform (WA0301) inspection processes, safety procedures, lock out, tagging and site preparation procedures • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / perform under supervision (WA0203) / perform (WA0303) a range of mechanical fault-finding, repairs, installation and commissioning tasks (pumps) • WA0104, WA0204, WA0304: The experience must include a variety of breakdowns on pumps
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<ul style="list-style-type: none"> • PA0206 Identify, select and use the required hand tools, power tools and equipment • PA0207 Disassemble the pump following the specified procedure • PA0208 Inspect components and parts and confirm required repairs • PA0209 Replace components or parts following the specified procedure • PA0210 Reassemble the pump following the specified procedure • PA0211 Check and confirm that repairs have resolved the problem or fault • PA0212 Conduct post-repair activities <p>PM-08-PS02: Overhaul a pump <i>Given a used pump with worn components, tools, access to everything need to overhaul a pump, personal protective equipment, specifications,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA080201 Identify and select specific tools, equipment and materials required for the overhaul process • PA080202 Identify potential hazards and risks related to the job and list the appropriate responses • PA080203 Disassemble the pump and prepare the components for inspection • PA080204 Inspect the components and draw up a material and replacement parts list 		<p>WM-04-WE04 Perform repairs on mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts (pumps)</p> <ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods. • Perform housekeeping as per industry standards <p><u>OVERHAULING (pumps)</u></p> <p>WM-05-WE01: For a period of two weeks, assist an experienced artisan overhauling mechanical sub-assemblies and machines</p> <p>WM-05-WE02: Overhaul a range mechanical machines and sub-assemblies under supervision</p> <p>WM-05-WE03: Overhaul a range mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Observe (WA0101) / perform under supervision (WA0201) / perform (WA0301) overhaul planning processes
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<ul style="list-style-type: none"> • PA080205 Replace all worn parts to specification • PA080206 Assemble and restore the pump to conform to the service tolerances specified in the manufacturer specifications • PA080207 Perform post overhauling activities 		<p>and pre-overhauling inspection procedures</p> <ul style="list-style-type: none"> • Observe and assist with (WA0103) / perform under supervision (WA0203) / perform (WA0303) a range of overhauling tasks • WA0103 The experience must include a variety of overhauling projects on pumps <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications
ASSESSMENT CRITERIA		
<p>PM-03-PS03: Disassemble, clean, inspect and assemble pumps</p> <ul style="list-style-type: none"> • IAC0301 Procedures to disassemble, clean and inspect a pump are explained • IAC0302 A pump is disassembled, cleaned and inspected according to procedure • IAC0303 Risks and hazards are identified and responded to in a responsible manner 	<p>KM-02-KT05 Types and application of pumps</p> <ul style="list-style-type: none"> • IAC0501 Classification and types of pumps are identified and discussed • IAC0502 Application of pumps is discussed • IAC0503 Components of pumps are identified and discussed • IAC0504 Functions and working principles of pumps are described 	<p>Supporting Evidence</p> <p><u>ROUTINE MAINTENANCE</u></p> <p>WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines</p> <p>WM-02-WE02 Perform routine maintenance of a range mechanical</p>

<ul style="list-style-type: none"> • IAC0304 Pump component or part numbers are recorded correctly before and during disassembly • IAC0305 All worn, damaged and defective components are identified correctly • IAC0306 Pump types and Original Equipment Manufacturer specifications are explained • IAC0307 Signs and causes of worn, damaged and defective components are explained • Perform housekeeping as per industry standards <p>PM-10-PS02: Do fault-finding on pumps</p> <ul style="list-style-type: none"> • IAC0201 Defects or faults on pump are identified correctly • IAC0202 Corrective actions and options are explained correctly and motivated • IAC0203 A systematic fault-finding process is followed • IAC0204 Risks and hazards are identified and responded to in a responsible manner <p>PM-04-PS02: Replace pump components and assemble pumps</p> <ul style="list-style-type: none"> • IAC0201 Procedures to replace pump components and assemble a pump are explained • IAC0202 Pump components are replaced according to procedures 	<ul style="list-style-type: none"> • IAC0505 Removal and installation procedures for pumps are described • IAC0506 Safety precautions pertaining to pumps are explained • 	<p>machines and sub-assemblies under supervision</p> <p>WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p> <p>WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records <p><u>FAULT FINDING AND REPAIRS</u></p> <p>WM-04-WE01 For a period of two weeks, assist an experienced artisan repairing faults on mechanical sub-assemblies and machines</p> <p>WM-04-WE02 Perform repairs on mechanical sub-assemblies and machines</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <p>WM-04-WE04 Perform repairs on mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records
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<ul style="list-style-type: none"> • IAC0203 A pump is assembled according to procedure and Original Equipment Manufacturer specifications • IAC0204 Risks and hazards are identified and responded to in a responsible manner <p>PM-06-PS 02: Repair pumps</p> <ul style="list-style-type: none"> • IAC0201 Instructions and repair specifications are interpreted correctly • IAC0202 Pump components and specifications are identified correctly • IAC0203 The pump is disassembled and reassembled correctly • IAC0204 Faulty components are identified and replaced correctly • IAC0205 Sequences to repair the pump are followed correctly • IAC0206 Tools and equipment are identified and used correctly • IAC0207 Post repair activities are performed correctly • IAC0208 Safety requirements are met <p>PM-08-PS02: Overhaul a pump</p> <ul style="list-style-type: none"> • Safety requirements are met • Overhauling specifications and quality requirements are explained accurately • Tools, equipment, materials and parts are identified and described correctly • The sequence of activities to overhaul the pump is adhered to 		<p><u>OVERHAULING</u></p> <p>WM-05-WE01: For a period of two weeks, assist an experienced artisan overhauling mechanical sub-assemblies and machines</p> <p>WM-05-WE02: Overhaul a range mechanical machines and sub-assemblies under supervision</p> <p>WM-05-WE03: Overhaul a range mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio
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<ul style="list-style-type: none"> • The final product meets service tolerances specified in the manufacturer specifications 		
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 15 questions (30 min) and the competency will be at 80% • Practical exercise of 180min (SINGLE STAGE) covering all items mentioned above. <ul style="list-style-type: none"> ○ No injury or unsafe act had occurred ○ Dismantle pump correctly ○ Inspect and record conditions of pump components as listed ○ Pump must be assembled correctly ○ Axial float to instruction given ○ Assessor to verify shaft run - out ○ Pump must be assembled correctly ○ Impeller to be adjusted central to 25% forward of the central position in the pump case and must not rub (Envirotech / Warman pump) ○ The end play on the shafts must be measured, recorded and set according to manufacturer's specifications ○ There must be no damage to equipment ○ Identify the following types of pumps: <ul style="list-style-type: none"> ▪ centrifugal ▪ reciprocating ▪ gear ○ Define the terms positive and non-positive displacement. ○ Install gland bush packing. ○ Install a mechanical seal. ○ Prime centrifugal, reciprocating and gear pumps. ○ Diagnose faults on centrifugal, reciprocating and gear pumps. ○ Interpret given flow diagrams and systems. ○ All safety aspects adhered to according company policies ○ No injury or damage to equipment 		

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of tolerance and Fits, lubrications, pumps
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- CDs and videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles
- KSB Pump
- Envirotech Pump
- Warman Pump
- Tool list including but not limited to: Pressure and flow meters Socket and spanner sets, Torque wrench, DTI, Steel ruler, Bearing replacement equipment, Mallet, Packing extractors and retractable blade Knife and V Blocks

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>I2</h1>
		Curriculum code: 653303000		
Learning area title: Perform work activities on pumps for water systems and water related valves	Total hours	SDP	WP	
		112	112	
Work situation title: Perform routine maintenance, fault finding, repair and reassembly activities on water related valves	Total hours	32	32	
Work scenario: Chester is working on a water line. He closed the valve and tested for zero energy. He then discovers that there is still a lot of pressure in the pipeline. On further investigation he finds that the ball valve he closed is no longer sealing. He removes the faulty ball valve and replaces it. The replaced components must conform to OEM standards before returned to service.				
Prerequisite learning: I1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-08-PS11: Disassemble, clean and inspect valves <i>Given a selection of various types of valve, relevant diagrams, tools, personal protective equipment, specifications, cleaning materials and solvents,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA1101 Procedures to disassemble, clean and inspect a valve are explained PA1102 A valve is disassembled, cleaned and inspected according to procedure PA1103 Risks and hazards are identified and responded to in a responsible manner PA1104 Components and components' numbers of a valve are recorded correctly before and during disassembly PA1105 All worn, damaged and defective components are identified correctly 	<p>Knowledge of:</p> <p>KM-02-KT03: Types and application of valves</p> <ul style="list-style-type: none"> KT0301 Classification and types of valves (Classification includes linear motion, rotary motion and quarter turn valves; types include gate, diaphragm; non-return, relief, ball shut-off valves; also included are pipe systems.) KT0302 Terminology of valves KT0303 Function and working principles of valves KT0304 Removal and installation of valves <p><u>Applied Knowledge</u></p> <p>PM-08-PS11: Disassemble, clean and inspect valves</p>		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p><u>ROUTINE MAINTENANCE</u> WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> Observe (WA0101) / conduct under supervision (WA0201) / conduct (WA0301) inspection processes, safety 	

<ul style="list-style-type: none"> • PA1106 Valve types and Original Equipment Manufacturer specifications are explained • PA1107 Signs and causes of worn, damaged and defective components are explained <p>Perform fault finding on valves <i>Given a selection of various types of valve, relevant tools, personal protective equipment, specifications and material,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Identify potential hazards and risks related to the job and list the appropriate responses • Visually inspect or assess valves condition • Identify possible faults • Determine corrective actions and options for dealing with identified faults • Report valves faults or defects • Conduct post-diagnosis and fault-finding activities • Select care and post activity's regarding tools and equipment • Perform Housekeeping as per industry standards <p>PM-04-PS10: Replace valve components and assemble valves <i>Given a selection of various types of valve, relevant tools, personal protective equipment, specifications and material,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA1001 Plan and prepare for 	<ul style="list-style-type: none"> • AK1101 Procedures to disassemble, clean and inspect valves • AK1102 Original Equipment Manufacturer valve specifications • AK1103 Types and applications of valves • AK1104 Valve components and component numbers • AK1105 Signs and causes of wear, damage, failure and defects in components • AK1106 Safe handling and storage of components <p>PM-04-PS10: Replace valve components and assemble valves</p> <ul style="list-style-type: none"> • AK1001 Procedures to replace and assemble a valve • AK1002 Original Equipment Manufacturer valve specifications • AK1003 Types and applications of valves • AK1004 Valve components and applications 	<p>procedures, lock out, tagging and site preparation procedures during routine maintenance</p> <ul style="list-style-type: none"> • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / conduct under supervision (WA0203) / conduct (WA0303) a range of routine maintenance tasks of varying complexity • WA0104, WA0204, WA0304: The experience must include routine maintenance on valves <p>WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts (valves)</p> <ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods.
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<p>replacement of valve components and assembly of a valve</p> <ul style="list-style-type: none"> • PA1002 Identify potential hazards and risks related to the job and list the appropriate responses • PA1003 Select tools, materials and equipment • PA1004 Replace worn, damaged or defective components and parts • PA1005 Assemble, set and record valve component or part numbers and specifications • PA1006 Conduct post-assembly activities 		<ul style="list-style-type: none"> • Perform Housekeeping as per industry standards <p><u>FAULT FINDING AND REPAIRS</u></p> <p>WM-04-WE01 For a period of two weeks, assist an experienced artisan repairing faults on mechanical sub-assemblies and machines</p> <p>WM-04-WE02 Perform repairs on mechanical sub-assemblies and machines</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Observe (WA0101) / perform under supervision (WA0201) / perform (WA0301) inspection processes, safety procedures, lock out, tagging and site preparation procedures • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / perform under supervision (WA0203) / perform (WA0303) a range of mechanical fault-finding, repairs, installation and commissioning tasks (valves) • WA0104, WA0204, WA0304: The experience must include a variety of breakdowns on valves
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		<p>WM-04-WE04 Perform repairs on mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts (valves)</p> <ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods. • Perform housekeeping as per industry standards <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling & storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications
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ASSESSMENT CRITERIA

PM-08-PS11: Disassemble, clean and inspect valves

- IAC1101 Procedures to disassemble, clean and inspect a valve are explained
- IAC1102 A valve is disassembled, cleaned and inspected according to procedure
- IAC1103 Risks and hazards are identified and responded to in a responsible manner
- IAC1104 Valve components and component numbers are recorded correctly before and during disassembly
- IAC1105 All worn, damaged and defective components are identified correctly
- IAC1106 Valve types and Original Equipment Manufacturer specifications are explained
- IAC1107 Signs and causes of worn, damaged and defective components are explained

Perform fault-finding on valves

- Defects or faults on valves are identified correctly
- Corrective actions and options are explained correctly and motivated
- A systematic fault-finding process is followed
- Risks and hazards are identified and responded to in a responsible manner

KM-02-KT03: Types and application of valves

- IAC0301 Classification and types of valves are identified and discussed
- IAC0302 Application of valves is discussed
- IAC0303 Components of valves and pipe systems are identified and discussed
- IAC0304 Functions and working principles of valves are described
- IAC0305 Removal and installation procedures for valves are described
- IAC0306 Safety precautions pertaining to valves are explained

Supporting Evidence

WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously

- SE0301 Signed-off job cards
- SE0302 Non-conformance reports
- SE0303 Workplace logbook or portfolio
- SE0304 Equipment downtime records

<p>PM-04-PS10: Replace valve components and assemble valves</p> <ul style="list-style-type: none"> • IAC1001 Procedures to replace valve components and assemble a valve are explained • IAC1002 Valve components are replaced according to procedures • IAC1003 A valve is assembled according to procedure and Original Equipment Manufacturer specifications • IAC1004 Risks and hazards are identified and responded to in a responsible manner 		
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 15 questions (30 min) and the competency will be at 80% • Practical exercise of 60min length covering all associated tasks and procedures. <ul style="list-style-type: none"> ○ No injury or unsafe act had occurred ○ No damage to equipment ○ Interpret symbols and abbreviations ○ Classification and types of valves are identified and discussed ○ Application of valves is discussed ○ Components of valves are identified and discussed ○ Functions and working principles of valves are described ○ Removal and installation procedures for valves are described ○ Glands replaced correctly ○ Valve pressure tested to 200kpi ○ Schore marks recorded correctly ○ Stam straightness checked ○ Glan packing cut 45" & 120, Staggered ○ Gate valve reseated ○ Safety precautions pertaining to valves adhered to 		

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of Valves
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles
- Gate valve 75-100mm
- Different gland sizes
- Pressure test equipment for gate valves (including Gauges) s
- Seating table for gate valve
- Gaskets and flanges
- Ringset spanners and Pipe wrench
- Allen keys
- Steel ruler
- Knife (Retractable blade)
- Hammer

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>13</h1>	
		Curriculum code: 653303000			
Learning area title: Perform work activities on pumps for water systems and water related valves		Total hours	SDP		WP
			112		112
Work situation title: Install, align and commission pumps for water systems and water related valves		Total hours	40	40	
Work scenario: Nkamo is tasked with the installation of a new cooling system pump on the furnace. She has to ensure that the pump installation, alignment and commissioning adhere to OEM specifications. After he installed the new pump and ensured the alignment is correct and the bolts are torqued to specifications, he can start priming the pump to test. Safety is a non-negotiable.					
Prerequisite learning: I2					
INTEGRATED LEARNING CONTENT					
Practical skills modules (PM)	Knowledge modules (KM)	Work experience modules (WM)			
<p>PM-07-PS02: Install and commission pumps <i>Given practical assignments, repaired or overhauled pumps, tools, personal protective equipment and specifications,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0201 Read and interpret the installation and commissioning specifications and quality requirements • PA0202 Identify and select specific tools, equipment and materials required for the installation and commissioning process • PA0203 Plan the sequences for installation and commissioning • PA0204 Identify potential hazards and risks related to the job and list the appropriate responses • PA0205 Prepare the work area for installation of the pump • PA0206 Install and align the pump to specifications 	<p>Knowledge of:</p> <p>KM-02-KT05: Types and application of pumps</p> <ul style="list-style-type: none"> • KT0501 Classification of pumps • KT0502 Terminology of pumps • KT0503 Functions and working principles of pumps <p>KM-02-KT03 Types and application of valves</p> <ul style="list-style-type: none"> • KT0301 Classification and types of valves (Classification includes linear motion, rotary motion and quarter turn valves and types include gate, non-return, relief, ball shut-off valves. Also included are pipe systems.) • KT0302 Terminology of valves • KT0303 Function and working principle of valves 	<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously [Focus: Install, align and commission]</p> <ul style="list-style-type: none"> • WA0301 Perform inspection processes safety procedures, lock out, tagging and site preparation procedures • WA0302 Interact with production personnel and report • WA0303 Perform installation and commissioning tasks for pumps and valves <ul style="list-style-type: none"> ○ Gather necessary technical information, develop installation and commissioning plan, list and obtain required parts & materials ○ Install as per manufacturers' and 			

<ul style="list-style-type: none"> • PA0207 Use tools and equipment correctly • PA0208 Follow the correct installation procedures and sequence • PA0209 Check the pump installation by performing a systematic inspection of all the critical control points • PA0210 Commission the pump by performing a final inspection and performance test • PA0211 Perform post installation and commissioning activities • Alignment of the pump & drive system • Install a valve and ensure that there is no leaks and the flow is in the correct direction • Bolts secured • Select and fit correct gasket • Operation of the opening and closing of the valve • Perform housekeeping as per industry standards 	<ul style="list-style-type: none"> • KT0304 Removal and installation of valves <p><u>Applied Knowledge</u></p> <p>PM-07-PS02: Install and commission pumps</p> <ul style="list-style-type: none"> • AK0201 Pump installation, alignment and commissioning procedures and specifications • AK0202 Use and care of tools and equipment • Alignment of the pump and the drive system <p>Install and commission valves</p> <ul style="list-style-type: none"> • Valves installation and commissioning procedures and specifications • Use and care of tools and equipment 	<p>workplace specifications</p> <ul style="list-style-type: none"> ○ Conduct post-installation inspection and functionality tests and commission the installations ○ Complete all relevant documentation <ul style="list-style-type: none"> • Perform Housekeeping as per industry standards <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling & storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications •
ASSESSMENT CRITERIA		
<p>PM-07-PS02: Install and commission pumps</p> <ul style="list-style-type: none"> • IAC0201 Installation and alignment is performed to requirements and specifications • IAC0202 Commissioning is performed to requirements • IAC0203 Quality requirements are met • IAC0204 Tools and equipment are used appropriately and correctly • IAC0205 Safety requirements are met 	<p>KM-02-KT05: Types and application of pumps</p> <ul style="list-style-type: none"> • IAC0501 Classification and types of pumps are identified and discussed • IAC0502 Application of pumps is discussed • IAC0503 Components of pumps are identified and discussed • IAC0504 Functions and working principles of pumps are described • IAC0505 Removal and installation 	<p>Supporting Evidence:</p> <p>Supporting Evidence</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • SE0301 Signed-off job cards • SE0302 Non-conformance reports • SE0303 Workplace logbook or portfolio • SE0304 Equipment downtime records

<p>Install and commission valves</p> <ul style="list-style-type: none"> • Installation is performed to requirements and specifications • Commissioning is performed to requirements • Quality requirements are met • Tools and equipment are used appropriately and correctly • Safety requirements are met 	<p>procedures for pumps are described</p> <ul style="list-style-type: none"> • IAC0506 Safety precautions pertaining to pumps are explained <p>KM-02-KT03 Types and application of valves</p> <ul style="list-style-type: none"> • Classification and types of valves are identified and discussed • Application of valves is discussed • Components of valves and pipe systems are identified and discussed • Functions and working principles of valves are described • Removal and installation procedures for valves are described • Safety precautions pertaining to valves are explained 	<ul style="list-style-type: none"> • Installation documentation •
<p>Internal Assessment to be performed:</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 30 questions (45 min) and the competency will be at 80% • Practical exercise of 120min length covering all items mentioned above <ul style="list-style-type: none"> ○ No injury or unsafe act had occurred ○ No damage to equipment ○ Dismantle pump correctly ○ Pump must be assembled correctly ○ No damage to equipment ○ Inspect and record conditions of pump components as listed ○ Impeller to be adjusted central to 25% forward of the central position in the pump case and must not rub (Envirotech / Warman pump) ○ The damage and/or wear to the parts must be correctly inspected. ○ Identify the following types of pumps: <ul style="list-style-type: none"> ▪ centrifugal ▪ reciprocating ▪ gear 		

- Define the terms positive and non-positive displacement.
- Install gland bush packing.
- Prime centrifugal, reciprocating and gear pumps.
- Diagnose faults on centrifugal, reciprocating and gear pumps.
- Interpret given flow diagrams and systems.
- All safety aspects adhered to according company policies
- Glands replaced correctly
- Valve pressure tested to 200kpi 75 to 100 mm gate valve
- Level of competence required: 100%

Learning resources for teaching

- Learning material
- Samples (and charts) of tolerance and Fits, lubrications, pumps and valves and seals
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- CDs and videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles
- Set of Spanners and Sockets
- Torque wrench
- Screwdrivers
- Rubber Mallet
- Allen keys
- Clock gauge
- Variety of shims
- Tape measure
- Vernier or Micrometre
- Tommy bar
- Gasket material
- Inside calliper
- Feeler gauge

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		J1
		Curriculum code: 653303000		
Learning area title: Perform work activities on brakes and clutches	Total hours	SDP	WP	
		56	56	
Work situation title: Perform routine maintenance, fault finding, repair, reassembly and alignment activities on brakes and clutches	Total hours	40	40	
Work scenario: Jimmy is called to a breakdown on a drive unit. The drive is connected to the output by means of a clutch. On inspection of the brake and clutch, he found it to be both excessively hot, with the clutch totally disengaged under no load. This means that the clutch has failed and needs to be replaced. He must address the brake function as well, while the drive is isolated.				
Prerequisite learning: Year 1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-03-PS04 Disassemble, clean and inspect a brake <i>Given a selection of various types of brakes, relevant tools, personal protective equipment, specifications, cleaning materials and solvents,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0401 Plan and prepare workplace for disassembling a brake • PA0402 Identify potential hazards and risks related to the job and list the appropriate responses • PA0403 Select tools and cleaning materials • PA0404 Disassemble and record brake component or part numbers and specifications • PA0405 Clean brake components 	<p>Knowledge of:</p> <p>KM-02-KT07: Mechanical working principles, types and applications of clutches</p> <ul style="list-style-type: none"> • KT0701 Types of clutches • KT0702 Terminology of clutches • KT0703 Functions and working principles of clutches • KT0704 Removal and installation procedure for clutches <p>KM-02-KT08: Mechanical working principles, types and applications of brakes</p> <ul style="list-style-type: none"> • KT0801 Types of brakes • KT0802 Terminology of brakes • KT0803 Functions and working principles of brakes 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p><u>ROUTINE MAINTENANCE</u> WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p>	

<ul style="list-style-type: none"> • PA0406 Visually inspect component condition (wear, damage, defect, failure) according to Original Equipment Manufacturer specifications • PA0407 Conduct post-disassembling activities <p>PM-05-PS03 Do fault-finding on a brake <i>Given practical assignments, faulty brakes, tools, diagnostic equipment, personal protective equipment and specifications,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0301 Identify potential hazards and risks related to the job and list the appropriate responses • PA0302 Visually inspect or assess brake condition • PA0303 Identify possible faults • PA0304 Determine corrective actions and options for dealing with identified faults • PA0305 Report faults or defects on brake • PA0306 Conduct post-diagnosis and fault-finding activities <p>PM-04-PS03: Replace brake components and assemble brakes <i>Given a selection of various types of brake, relevant tools, personal protective equipment, specifications and material,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0301 Plan and prepare for replacement of brake components and assembly of a brake 	<ul style="list-style-type: none"> • KT0804 Removal and installation procedures for brakes <p>KM-02-KT13: Diagnostic techniques</p> <ul style="list-style-type: none"> • KT1301 Diagnostic equipment • KT1302 Diagnostic techniques • KT1303 Diagnostic testing <p><u>Applied Knowledge</u></p> <p>PM-03-PS04 Disassemble, clean and inspect a brake</p> <ul style="list-style-type: none"> • AK0401 Procedures to disassemble, clean and inspect brakes • AK0402 Original Equipment Manufacturer brake specifications • AK0403 Brake components and component numbers • AK0404 Signs and causes of wear, damage, failure and defects in components • AK0405 Safe handling and storage of components <p>PM-05-PS03 Do fault-finding on a brake</p> <ul style="list-style-type: none"> • AK0301 Procedures to diagnose brake problems • AK0302 Procedures to do fault-finding on a brake • AK0303 Original Equipment Manufacturer (OEM) specifications for a brake • AK0304 Signs, symptoms and causes of faults • AK0305 Types of brake faults • AK0306 Possible corrective actions and options to repair faults 	<ul style="list-style-type: none"> • Observe (WA0101) / conduct under supervision (WA0201) / conduct (WA0301) inspection processes, safety procedures, lock out, tagging and site preparation procedures during routine maintenance • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / conduct under supervision (WA0203) / conduct (WA0303) a range of routine maintenance tasks of varying complexity (breaks and clutches) • WA0104, WA0204, WA0304: The experience must include routine maintenance breaks and clutches <p>WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts (breaks and clutches)</p> <ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high
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<ul style="list-style-type: none"> • PA0302 Identify potential hazards and risks related to the job and list the appropriate responses • PA0303 Select tools, materials and equipment • PA0304 Replace worn, damaged or defective components and parts • PA0305 Assemble, set and record brake component or part numbers and specifications • PA0306 Conduct post-assembly activities <p>PM-06-PS 03 Repair a brake <i>Given a faulty brake, replacement components, lubricants, diagnostic information, sequence of work, specifications, tools and personal protective equipment</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0301 Read and interpret the practical assignments on specific repairs required • PA0302 Read and interpret the standard repair specifications and quality requirements from the manufacturer • PA0303 Identify components, parts, seals, lubricants and specifications of these that must be available for repair • PA0304 Plan the sequence of work to repair the brake • PA0305 Identify potential hazards and risks related to the job and list the appropriate responses 	<p>PM-04-PS03: Replace brake components and assemble brakes</p> <ul style="list-style-type: none"> • AK0301 Procedures to replace, assemble and set a brake • AK0302 Original Equipment Manufacturer brake specifications • AK0303 Types and applications of brakes • AK0304 Brake components and applications <p>PM-06-PS 03 Repair a brake</p> <ul style="list-style-type: none"> • AK0301 Procedures for repairing a brake • AK0302 Safety practices and procedures • AK0303 brake disassembly and assembly procedures • AK0304 brake component replacement procedures • AK0305 Lubricants, seals and part specifications • AK0306 Use of and care for tools and equipment <p>PM-05-PS04: Do fault-finding on clutches</p> <ul style="list-style-type: none"> • AK0401 Procedures to diagnose clutch problems • AK0402 Procedures to do fault-finding on clutches • AK0403 Original Equipment Manufacturer specifications for a clutch • AK0404 Signs, symptoms and causes of faults • AK0405 Types of clutch faults • AK0406 Possible corrective actions and options to repair faults 	<p>work volumes, peak production periods.</p> <ul style="list-style-type: none"> • Ensure all safety guards are replaced • Listen to abnormal noise on gearboxes and drives and report findings • Feel for abnormal vibration • Monitor for excessive heat • Inspect for missing components • Perform housekeeping as per prescribed industry standard <p><u>FAULT FINDING AND REPAIRS</u></p> <p>WM-04-WE01 For a period of two weeks, assist an experienced artisan repairing faults on mechanical sub-assemblies and machines</p> <p>WM-04-WE02 Perform repairs on mechanical sub-assemblies and machines</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Observe (WA0101) / perform under supervision (WA0201) / perform (WA0301) inspection processes, safety procedures, lock out, tagging and site preparation procedures • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / perform under supervision (WA0203) /
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<ul style="list-style-type: none"> • PA0306 Identify, select and use the required hand tools, power tools and equipment • PA0307 Disassemble the brake following the specified procedure • PA0308 Inspect components and parts and confirm required repairs • PA0309 Replace components or parts following the specified procedure • PA0310 Reassemble the brake following the specified procedure • PA0311 Check and confirm that repairs have resolved the problem or fault • PA0312 Conduct post-repair activities <p>PM-03-PS05: Disassemble, clean and inspect clutches</p> <ul style="list-style-type: none"> • PA0501 Plan and prepare workplace for disassembling a clutch • PA0502 Identify potential hazards and risks related to the job and list the appropriate responses • PA0503 Select tools and cleaning materials • PA0504 Disassemble and record clutch component or part numbers and specifications • PA0505 Clean clutch components • PA0506 Visually inspect component condition (wear, damage, defect, failure) according to Original Equipment Manufacturer specifications • PA0507 Conduct post-disassembling activities 	<p>PM-03-PS05: Disassemble, clean and inspect clutches</p> <ul style="list-style-type: none"> • AK0501 Procedures to disassemble, clean and inspect clutches • AK0502 Original Equipment Manufacturer clutch specifications • AK0503 Clutch components and component numbers • AK0504 Signs and causes of wear, damage, failure and defects in components • AK0505 Safe handling and storage of components <p>PM-04-PS04: Replace clutch components and assemble clutches</p> <ul style="list-style-type: none"> • AK0401 Procedures to replace, assemble and set a clutch • AK0402 Original Equipment Manufacturer clutch specifications • AK0403 Types and applications of clutch • AK0404 Clutch components and applications <p>PM-06-PS04 Repair a clutch</p> <ul style="list-style-type: none"> • AK0401 Procedures for repairing a clutch • AK0402 Safety practices and procedures • AK0403 Clutch disassembly and assembly procedures • AK0404 Clutch component replacement procedures • AK0405 Lubricants, seals and part specifications and parts' numbers • AK0406 Use of and care for tools and equipment • AK0407 Post repair activities 	<p>perform (WA0303) a range of mechanical fault-finding, repairs, installation and commissioning tasks (breaks and clutches)</p> <ul style="list-style-type: none"> • WA0104, WA0204, WA0304: The experience must include a variety of breakdowns on breaks and clutches <p>WM-04-WE04 Perform repairs on mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts (breaks and clutches)</p> <ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods • Perform housekeeping as per industry standards <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Standard operating procedures
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<p>PM-05-PS04: Do fault-finding on clutches <i>Given practical assignments, faulty clutches, tools, diagnostic equipment, personal protective equipment and specifications,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0401 Identify potential hazards and risks related to the job and list the appropriate responses • PA0402 Visually inspect or assess clutch condition • PA0403 Identify possible faults • PA0404 Determine corrective actions and options for dealing with identified faults • PA0405 Report faults or defects on a clutch • PA0406 Conduct post-diagnosis and fault-finding activities <p>PM-04-PS04: Replace clutch components and assemble clutches <i>Given a selection of various types of clutch, relevant tools, personal protective equipment, specifications and materials,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0401 Plan and prepare for replacement of clutch components and assembly of a clutch • PA0402 Identify potential hazards and risks related to the job and list the appropriate responses • PA0403 Select tools, materials and equipment 		<ul style="list-style-type: none"> • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications
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<ul style="list-style-type: none"> • PA0404 Replace worn, damaged or defective components and parts • PA0405 Assemble, set and record clutch component or part numbers and specifications • PA0406 Conduct post-assembly activities • Perform Housekeeping as per industry standard <p>PM-06-PS04: Repair a clutch <i>Given faulty clutches, replacement components, lubricants, diagnostic information, sequence of work, specifications, tools and personal protective equipment,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0401 Read and interpret the practical assignments on specific repairs required • PA0402 Read and interpret the standard repair specifications and quality requirements from the manufacturer • PA0403 Identify components, parts, seals, lubricants and specifications of these that must be available for repair • PA0404 Plan the sequence of work to repair the clutch • PA0405 Identify potential hazards and risks related to the job and list the appropriate responses • PA0406 Identify, select and use the required hand tools, power tools and equipment • PA0407 Disassemble the clutch following the specified procedure 		
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<ul style="list-style-type: none"> • PA0408 Inspect components and parts and confirm required repairs • PA0409 Replace components or parts following the specified procedure • PA0410 Reassemble the clutch following the specified procedure • PA0411 Check and confirm that repairs have resolved the problem or fault • PA0412 Conduct post-repair activities 		
ASSESSMENT CRITERIA		
<p>PM-05-PS03: Do fault-finding on a brake</p> <ul style="list-style-type: none"> • IAC0401 Procedures to disassemble, clean and inspect a brake are explained • IAC0402 A brake is disassembled, cleaned and inspected according to procedure • IAC0403 Risks and hazards are identified and responded to in a responsible manner • IAC0404 Brake component or part numbers are recorded correctly before and during disassembly • IAC0405 All worn, damaged and defective components are identified correctly • IAC0406 Brake types and Original Equipment Manufacturer specifications are explained • IAC0407 Signs and causes of worn, damaged and defective components are explained <p>PM-03-PS04 Disassemble, clean and inspect a brake:</p> <ul style="list-style-type: none"> • IAC0401 Procedures to disassemble, clean and inspect a brake are explained 	<p>KM-02-KT07: Mechanical working principles, types and applications of clutches</p> <ul style="list-style-type: none"> • IAC0701 Types of clutches are identified and described • IAC0702 Components of clutches are identified and discussed • IAC0703 Functions and working principles of clutches are described • IAC0704 Removal and installation procedures for clutches are described • IAC0705 Safety precautions pertaining to clutches are explained <p>KM-02-KT08: Mechanical working principles, types and applications of brakes</p> <ul style="list-style-type: none"> • IAC0801 Types of brakes are identified and described • IAC0802 Components of brakes are identified and discussed • IAC0803 Functions and working principles of brakes are described 	<p>Supporting Evidence</p> <p><u>ROUTINE MAINTENANCE</u></p> <p>WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines</p> <p>WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision</p> <p>WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p> <p>WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports

<ul style="list-style-type: none"> • IAC0402 A brake is disassembled, cleaned and inspected according to procedure • IAC0403 Risks and hazards are identified and responded to in a responsible manner • IAC0404 Brake component or part numbers are recorded correctly before and during disassembly • IAC0405 All worn, damaged and defective components are identified correctly • IAC0406 Brake types and Original Equipment Manufacturer specifications are explained • IAC0407 Signs and causes of worn, damaged and defective components are explained <p>PM-04-PS03: Replace brake components and assemble brakes</p> <ul style="list-style-type: none"> • IAC0301 Procedures to replace brake components and assemble a brake are explained • IAC0302 Brake components are replaced according to procedures • IAC0303 A brake is assembled according to procedure and Original Equipment Manufacturer specifications • IAC0304 Risks and hazards are identified and responded to in a responsible manner <p>PM-06-PS 03 Repair a brake</p> <ul style="list-style-type: none"> • Post repair activities • Internal Assessment Criteria • Instructions and repair specifications are interpreted correctly 	<ul style="list-style-type: none"> • IAC0804 Removal and installation procedures for brakes are described • IAC0805 Safety precautions pertaining to brakes are explained <p>KM-02-KT13: Diagnostic techniques</p> <ul style="list-style-type: none"> • IAC1301 Types of diagnostic equipment are identified and described • IAC1302 The various types of diagnostic techniques are described • IAC1303 The sequence involved in a diagnostic procedure or technique is explained • IAC1304 Safety precautions pertaining to diagnostic equipment are explained 	<ul style="list-style-type: none"> • Workplace logbook or portfolio • Equipment downtime records <p><u>FAULT FINDING AND REPAIRS</u></p> <p>WM-04-WE01 For a period of two weeks, assist an experienced artisan repairing faults on mechanical sub-assemblies and machines</p> <p>WM-04-WE02 Perform repairs on mechanical sub-assemblies and machines</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <p>WM-04-WE04 Perform repairs on mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records
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<ul style="list-style-type: none"> • Brake components and specifications are identified correctly • The brake is disassembled and reassembled correctly • Faulty components are identified and replaced correctly • Sequences to repair the brake are followed correctly • Tools and equipment are identified and used correctly • Post repair activities are performed correctly • Safety requirements are met <p>PM-05-PS04: Do fault-finding on a Clutch</p> <ul style="list-style-type: none"> • IAC0501 Procedures to disassemble, clean and inspect a clutch are explained • IAC0502 A clutch is disassembled, cleaned and inspected according to procedure • IAC0503 Risks and hazards are identified and responded to in a responsible manner • IAC0504 Clutch component or part numbers are recorded correctly before and during disassembly • IAC0505 All worn, damaged and defective components are identified correctly • IAC0506 Clutch types and Original Equipment Manufacturer specifications are explained • IAC0507 Signs and causes of worn, damaged and defective components are explained 		
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<p>PM-08-PS05: Disassemble, clean and inspect clutches</p> <ul style="list-style-type: none"> • IAC0501 Procedures to disassemble, clean and inspect a clutch are explained • IAC0502 A clutch is disassembled, cleaned and inspected according to procedure • IAC0503 Risks and hazards are identified and responded to in a responsible manner • IAC0504 Clutch component or part numbers are recorded correctly before and during disassembly • IAC0505 All worn, damaged and defective components are identified correctly • IAC0506 Clutch types and Original Equipment Manufacturer specifications are explained • IAC0507 Signs and causes of worn, damaged and defective components are explained <p>PM-04-PS04: Replace clutch components and assemble clutches</p> <ul style="list-style-type: none"> • IAC0401 Procedures to replace clutch components and assemble a clutch are explained • IAC0402 Clutch components are replaced according to procedures • IAC0403 A clutch is assembled according to procedure and Original Equipment Manufacturer specifications • IAC0404 Risks and hazards are identified and responded to in a responsible manner 		
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<p>PM-06-PS04 Repair a clutch</p> <ul style="list-style-type: none"> • Instructions and repair specifications are interpreted correctly • Clutch components and specifications are identified correctly • The clutch is disassembled and reassembled correctly • Faulty components are identified and replaced correctly • Sequences to repair the clutch are followed correctly • Tools and equipment are identified and used correctly • Post repair activities are performed correctly • Safety requirements are met 		
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 20 questions (40 min) and the competency will be at 80% • Practical exercise of 120min covering all items mentioned above <ul style="list-style-type: none"> ○ No injury or unsafe act had occurred ○ Identify the following brake systems: <ul style="list-style-type: none"> ▪ disc ▪ thruster ▪ electro-magnetic ○ Maintain disc brakes. ○ Maintain thruster brakes - calliper type. ○ Maintain electro-magnetic brakes. ○ Identify centrifugal and multi-disc clutch systems. ○ Maintain a multi-disc clutch ○ Air gap according to manufacturer's specifications ○ The torque is set at 100nm 		

- The drum is in the centre of the brake shoe with a tolerance of 2mm
- The centre height of drum is correct with a tolerance of 0.5mm
- Time allowed 1.5 hours (per task)
- Safety aspects must be adhered to.
- All safety aspects adhered to according company policies
- No injury or damage to equipment

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of tolerance and fits, brake systems and clutches
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles
- Tools including but not limited to: Feeler gauge, Socket and Spanner set, Torque wrench, Cir-clip pliers, lifting equipment,
- Thrust Brake (Hydraulic or Electro-pneumatic)
- Different brake systems
- Different clutch systems

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>J2</h1>
		Curriculum code: 653303000		
Learning area title: Perform work activities on brakes and clutches	Total hours	SDP	WP	
		56	56	
Work situation title: Perform installation and commissioning activities on brakes and clutches	Total hours	16	16	
Work scenario: Doug is tasked with the installation of a new Thrust brake system that works with the long travel of an overhead crane. The installation of the brake system is situated between the drive and wheel. He has to set the brake according to the OEM Specification which requires the brake shoes placement be in the centre of the drum. The gap and all torque settings must be to specified limits. Safety is a non-negotiable.				
Prerequisite learning: J1				
Practical skills modules (PM)		Knowledge modules (KM)		Work experience modules (WM)
<p>PM-07-PS03: Install and commission brakes <i>Given practical assignments, repaired brakes, tools, personal protective equipment and specifications</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA0301 Read and interpret the installation and commissioning specifications and quality requirements PA0302 Identify and select specific tools, equipment and materials required for the installation and commissioning process PA0303 Plan the sequences for installation and commissioning PA0304 Identify potential hazards and risks related to the job and list the appropriate responses PA0305 Prepare the work area for 		<p>Knowledge of:</p> <p>KM-02-KT07: Mechanical working principles, types and applications of clutches</p> <ul style="list-style-type: none"> KT0701 Types of clutches KT0702 Terminology of clutches KT0703 Functions and working principles of clutches KT0704 Removal and installation procedure for clutches <p>KM-02-KT08: Mechanical working principles, types and applications of brakes</p> <ul style="list-style-type: none"> KT0801 Types of brakes KT0802 Terminology of brakes KT0803 Functions and working principles of brakes KT0804 Removal and installation 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM-04-WE03 Perform repairs on WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously [Focus: Install and commission]</p> <ul style="list-style-type: none"> WA0301 Perform inspection processes safety procedures, lock out, tagging and site preparation procedures WA0302 Interact with production personnel and report\ WA0303 Perform installation and commissioning tasks for breaks and clutches <ul style="list-style-type: none"> Gather necessary technical information, develop installation and commissioning plan, list and

<p>installation of the brake</p> <ul style="list-style-type: none"> • PA0306 Install and align brakes to specifications • PA0307 Use tools and equipment correctly • PA0308 Follow the correct installation procedures and sequence • PA0309 Check the brake installation by executing a systematic inspection of all the critical control points • PA0310 Commission the brake by performing a final inspection and performance test • PA0311 Perform post installation and commissioning activities <p>PM-07-PS04: Install and commission clutches</p> <ul style="list-style-type: none"> • PA0401 Read and interpret the installation and commissioning specifications and quality requirements • PA0402 Identify and select specific tools, equipment and materials required for the installation and commissioning process • PA0403 Plan the sequences for installation and commissioning • PA0404 Identify potential hazards and risks related to the job and list the appropriate responses • PA0405 Prepare the work area for 	<p>procedures for brakes</p> <p><u>Applied Knowledge</u></p> <p>PM-07-PS03: Install and commission brakes</p> <ul style="list-style-type: none"> • AK0301 Brake installation, alignment and commissioning procedures and specifications • AK0302 Use and care of tools and equipment <p>PM-07-PS04: Install and commission clutches</p> <ul style="list-style-type: none"> • AK0401 Clutch installation, alignment and commissioning procedures and specifications • AK0402 Use and care of tools and equipment 	<p>obtain required parts & materials</p> <ul style="list-style-type: none"> ○ Install as per manufacturers' and workplace specifications ○ Conduct post-installation inspection and functionality tests and commission the installations ○ Complete all relevant documentation ● Perform Housekeeping as per industry standards <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling & storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications
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<p>installation of the clutch</p> <ul style="list-style-type: none"> • PA0406 Install and align the clutch to specifications • PA0407 Use tools and equipment correctly • PA0408 Follow the correct installation procedures and sequence • PA0409 Check clutch installation by performing a systematic inspection of all the critical control points • PA0410 Commission the clutch by performing a final inspection and performance test • PA0411 Perform post installation and commissioning activities • Perform housekeeping as per industry standards • Performance assessment report for completion of work situation 		
ASSESSMENT CRITERIA		
<p>PM-07-PS03: Install and commission brakes</p> <ul style="list-style-type: none"> • IAC0301 Installation and alignment is performed to requirements and specifications • IAC0302 Commissioning is performed to requirements • IAC0303 Quality requirements are met • IAC0304 Tools and equipment are used appropriately and correctly • IAC0305 Safety requirements are met 	<p>KM-02-KT08: Mechanical working principles, types and applications of brakes</p> <ul style="list-style-type: none"> • IAC0801 Types of brakes are identified and described • IAC0802 Components of brakes are identified and discussed • IAC0803 Functions and working principles of brakes are described • IAC0804 Removal and installation procedures for brakes are described 	<p>Supporting Evidence</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • SE0301 Signed-off job cards • SE0302 Non-conformance reports • SE0303 Workplace logbook or portfolio • SE0304 Equipment downtime records • Installation documentation

<p>PM-07-PS03: Install and commission clutches</p> <ul style="list-style-type: none"> • IAC0401 Installation and alignment is performed to requirements and specifications • IAC0402 Commissioning is performed to requirements • IAC0403 Quality requirements are met • IAC0404 Tools and equipment are used appropriately and correctly • IAC0405 Safety requirements are met 	<ul style="list-style-type: none"> • IAC0805 Safety precautions pertaining to brakes are explained <p>KM-02-KT07: Mechanical working principles, types and applications of clutches</p> <ul style="list-style-type: none"> • IAC0701 Types of clutches are identified and described • IAC0702 Components of clutches are identified and discussed • IAC0703 Functions and working principles of clutches are described • IAC0704 Removal and installation procedures for clutches are described • IAC0705 Safety precautions pertaining to clutches are explained 	
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 30 marks (45 min) and the competency will be at 80% • Practical exercise of 90min in length covering all items mentioned above. <ul style="list-style-type: none"> ○ No injury or unsafe act had occurred ○ No damage to equipment ○ Identify the following brake systems: <ul style="list-style-type: none"> ▪ disc ▪ thruster ▪ electro-magnetic ○ The drum is in the centre of the brake shoe to specification ○ The centre height of drum is correct with a tolerance of 0.5mm. ○ Air gap according to manufacturer's specifications ○ The torque is set to specification ○ Identify centrifugal and multi-disc clutch systems ○ All safety aspects adhered to according company policies ○ Level of competency of 100% (critical) required for: Safety- isolate, lockout and test for zero potential 		

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of tolerance and Fits, Brakes systems and clutches
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- CDs and videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles
- Thrust Brake (Hydraulic or Electro-pneumatic)
- Different brake systems
- Different Clutch systems
- Set of Spanners and sockets
- Micrometres/Vernier
- Rubber Mallet
- Screwdriver
- Allen key set
- Torque Wrench
- Tape measure
- Feeler gauge
- Tommy bar

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>K1</h1>				
		Curriculum code: 653303000						
Learning area title: Perform work activities on bearings and lubrication systems		Total hours	<table border="1"> <tr> <td>SDP</td> <td>WP</td> </tr> <tr> <td>80</td> <td>104</td> </tr> </table>		SDP	WP	80	104
SDP	WP							
80	104							
Work situation title: Perform routine maintenance, fault find, repair and align bearings		Total hours	<table border="1"> <tr> <td>24</td> <td>40</td> </tr> </table>	24	40			
24	40							
Work scenario: The maintenance department is tasked with a shutdown on a production line. Sonny's responsibility includes installing the bearings. He has to adhere to OEM specifications throughout the execution of the task. After installing the bearings, he has to start-up the line and ensure that the system works correctly.								
Prerequisite learning: A1, B2, B3-B5, D+E								
INTEGRATED LEARNING CONTENT								
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)					
<p>PM-03-PS07: Remove and inspect bearings <i>Given a selection of various types of bearing assembly, relevant tools, personal protective equipment, specifications, cleaning materials and solvents</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA0701 Plan and prepare workplace for removing a bearing PA0702 Identify potential hazards and risks related to the job and list the appropriate responses PA0703 Select tools and cleaning materials PA0704 Disassemble bearing unit or housing PA0705 Remove bearing and record bearing part numbers and specifications PA0706 Clean bearing components PA0707 Visually inspect bearing condition (wear, damage, defect, failure) 	<p>Knowledge of:</p> <p>KM-02-KT02: Types and application of bearings</p> <ul style="list-style-type: none"> KT0201 Bearings (anti-friction and friction bearings) KT0202 Application of bearings KT0203 Maintenance of bearings KT0204 Causes of failures in bearings KT0205 Removal and installation of bearings <p><u>Applied Knowledge:</u></p> <p>PM-03-PS07: Remove and inspect bearings</p> <ul style="list-style-type: none"> AK0701 Procedures to remove and inspect bearings AK0702 Original Equipment Manufacturer bearing specifications AK0703 Signs and causes of wear, damage, failure and defects in 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p><u>ROUTINE MAINTENANCE</u></p> <p>WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines</p> <p>WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision</p> <p>WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> Observe (WA0101) / conduct under supervision (WA0201) / conduct (WA0301) inspection processes, safety procedures, lock out, tagging and site 					

<p>according to Original Equipment Manufacturer specifications</p> <ul style="list-style-type: none"> PA0708 Conduct post-removal and inspection activities <p>PM-05-PS06: Do fault-finding on bearings <i>Given practical assignments, faulty bearing, tools, diagnostic equipment, personal protective equipment and specifications</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA0601 Identify potential hazards and risks related to the job and list the appropriate responses PA0602 Visually inspect or assess bearing condition PA0603 Identify possible faults PA0604 Determine corrective actions and options for dealing with identified faults PA0605 Report faults or defects on bearings PA0606 Conduct post-diagnosis and fault-finding activities <p>PM-04-PS06: Replace bearings <i>Given a selection of various types of bearings, relevant tools, personal protective equipment, specifications and material</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA0601 Plan and prepare for replacing a bearing PA0602 Identify potential hazards and risks related to the job and list the appropriate responses 	<p>components</p> <ul style="list-style-type: none"> AK0704 Safe handling and storage of bearings <p>PM-05-PS06: Do fault-finding on bearings</p> <ul style="list-style-type: none"> AK0601 Procedures to diagnose bearing problems AK0602 Procedures to do fault-finding on bearings AK0603 Original Equipment Manufacturer specifications for bearings AK0604 Signs, symptoms and causes of faults on bearings AK0605 Types of bearing faults AK0606 Possible corrective actions and options to repair faults <p>PM-04-PS06: Replace bearings</p> <ul style="list-style-type: none"> AK0601 Procedures to replace a bearing AK0602 Original Equipment Manufacturer bearing specifications AK0603 Types and applications of bearings AK0604 Bearing lubrication procedures Housekeeping standards for routine maintenance Material Safety Data Sheet 	<p>preparation procedures during routine maintenance</p> <ul style="list-style-type: none"> Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting Observe and assist with (WA0103) / conduct under supervision (WA0203) / conduct (WA0303) a range of routine maintenance tasks of varying complexity (bearings) WA0104, WA0204, WA0304: The experience must include routine maintenance bearings <p>WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts (bearings)</p> <ul style="list-style-type: none"> WA0401 Perform tasks within accepted standards of performance under work pressure WA0402 Perform a range of routine maintenance tasks under work pressure WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods.
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<ul style="list-style-type: none"> • PA0603 Select tools, materials and equipment • PA0604 Replace or mount and set a bearing according to specifications • PA0605 Lubricate a bearing • PA0606 Conduct post-assembly activities 		<p><u>FAULT FINDING AND REPAIRS</u></p> <p>WM-04-WE01 For a period of two weeks, assist an experienced artisan repairing faults on mechanical sub-assemblies and machines</p> <p>WM-04-WE02 Perform repairs on mechanical sub-assemblies and machines</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Observe (WA0101) / perform under supervision (WA0201) / perform (WA0301) inspection processes, safety procedures, lock out, tagging and site preparation procedures • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / perform under supervision (WA0203) / perform (WA0303) a range of mechanical fault-finding, repairs, installation and commissioning tasks (bearings) • WA0104, WA0204, WA0304: The experience must include a variety of breakdowns on bearings <p>WM-04-WE04 Perform repairs on mechanical machines and sub-assemblies autonomously under work</p>
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		<p>pressure conditions such as shifts (bearings)</p> <ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods • Perform housekeeping as per industry standards <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling & storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications
ASSESSMENT CRITERIA		
<p>PM-08-PS07: Remove and inspect bearings</p> <ul style="list-style-type: none"> • IAC0701 Procedures to remove and inspect a bearing are explained 	<p>KM-04-KT02 Types, and application of bearings</p> <ul style="list-style-type: none"> • IAC0201 Types of bearings are differentiated • IAC0202 Components of bearings are 	<p>Supporting Evidence</p> <p><u>ROUTINE MAINTENANCE</u> WM-02-WE01 For a period of two weeks, assist an experienced artisan</p>

<ul style="list-style-type: none"> • IAC0702 Bearing unit or housing is disassembled correctly • IAC0703 A bearing is removed and inspected according to procedure • IAC0704 Risks and hazards are identified and responded to in a responsible manner • IAC0705 Bearing specifications and part numbers are recorded correctly • IAC0706 Worn, damaged and defective bearings are identified correctly • IAC0707 Bearing types and Original Equipment Manufacturer specifications are explained • IAC0708 Signs and causes of worn, damaged and defective components are explained <p>PM-05-PS06: Do fault-finding on bearings</p> <ul style="list-style-type: none"> • IAC0601 Defects or faults on bearing are identified correctly • IAC0602 Corrective actions and options are explained correctly and motivated • IAC0603 A systematic fault-finding process is followed • IAC0604 Risks and hazards are identified and responded to in a responsible manner <p>PM-04-PS06: Replace bearings</p> <ul style="list-style-type: none"> • IAC0601 Procedures to replace a bearing are explained 	<p>identified and discussed</p> <ul style="list-style-type: none"> • IAC0203 Applications for different bearings are discussed • IAC0204 The causes of bearing failure are described • IAC0205 Removal and installation procedures for bearings are described • IAC0206 Safety precautions pertaining to bearings are explained 	<p>performing routine maintenance on mechanical sub-assemblies and machines</p> <p>WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision</p> <p>WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p> <p>WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records <p><u>FAULT FINDING AND REPAIRS</u></p> <p>WM-04-WE01 For a period of two weeks, assist an experienced artisan repairing faults on mechanical sub-assemblies and machines</p> <p>WM-04-WE02 Perform repairs on mechanical sub-assemblies and machines</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <p>WM-04-WE04 Perform repairs on mechanical machines and sub-</p>
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<ul style="list-style-type: none"> • IAC0602 A bearing is replaced or mounted and set according to procedures and specifications • IAC0603 Risks and hazards are identified and responded to in a responsible manner 		<p>assemblies autonomously under work pressure conditions such as shifts</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records
<p>Internal Assessment to be performed:</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 15 questions (30 min) and the competency will be at 80% • Practical exercise of 60min length, covering all items mentioned above: <ul style="list-style-type: none"> ○ No injuries to self/co-worker and the environment or damage to equipment ○ Correct use of induction heater, oil heater, press, puller and hydraulic jack ○ Bearing must be heated to correct temperature ○ Bearings must be removed correctly ○ Bearings must be mounted correctly ○ Bearings are mounted according to specifications (Clearance chart) ○ Correct lubrication used <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material on defined Knowledge and Practical Skills Modules • Samples (and charts) of different bearings, clearances and lubrication • Safe Operating Procedure and Safe Working Procedure • Charts of risk assessment procedure and safety measures <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> • Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles • Tools include but not limited to: measuring equipment, hand tools, hand press, array of bearing heaters (induction, Oil bath), bearing pullers, infrared thermometer, Hand operated press • Lubrication charts, Heat detection chalk (Heat Sticks) • Bearings, bearing mounting sleeves 		

Occupation/trade title: Mechanical Fitter	SAQA ID: 94021			<h1>K2</h1>
	Curriculum code: 653303000			
Learning area title: Perform work activities on bearings and lubrication systems	Total hours	SDP	WP	
		80	104	
Work situation title: Perform routine maintenance, fault find, repair and align lubrication systems	Total hours	32	40	
Work scenario: Hun's responsibilities at the production plant includes the maintenance of the lubrication systems. As these systems are extremely important to the smooth operation, a failure can cause lengthy downtime and costly repairs. All reservoirs must be checked and replenished daily. Any defects or irregularity must be reported and repaired with the utmost urgency. Safety is of utmost importance.				
Prerequisite learning: A1, B1-B2				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-03-PS08: Clean and inspect lubrication systems</p> <p><i>Given a selection of various types of lubrication system, relevant drawings, tools, personal protective equipment, specifications, cleaning materials and solvents,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA0801 Plan and prepare for cleaning and inspecting a lubrication system PA0802 Identify potential hazards and risks related to the job and list the appropriate responses PA0803 Select tools and cleaning materials PA0804 Clean a lubrication system PA0805 Visually inspect a lubrication system for leaks, 	<p>Knowledge of:</p> <p>KM-02-KT09: Mechanical working principles, types and applications of lubrication systems</p> <ul style="list-style-type: none"> KT0901 Lubrication systems and devices KT0902 Properties of lubricants KT0903 Terminology of lubrication systems and devices KT0904 Working principles of lubrication systems and devices <p><u>Applied Knowledge</u></p> <p>PM-03-PS08: Clean and inspect lubrication systems</p> <ul style="list-style-type: none"> AK0801 Procedures to clean and inspect lubrication systems AK0802 Original Equipment Manufacturer specifications for a 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p><u>ROUTINE MAINTENANCE</u></p> <p>WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines</p> <p>WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision</p> <p>WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> Observe (WA0101) / conduct under supervision (WA0201) / conduct (WA0301) inspection processes, safety 	

<p>wear, damage, defects, and failures according to Original Equipment Manufacturer specifications</p> <ul style="list-style-type: none"> • PA0806 Conduct post-cleaning and inspecting activities <p>PM-05-PS: Do fault-finding on lubrication systems</p> <ul style="list-style-type: none"> • PA0701 Identify potential hazards and risks related to the job and list the appropriate responses • PA0702 Visually inspect or assess lubrication system condition • PA0703 Identify possible faults • PA0704 Determine corrective actions and options for dealing with identified faults • PA0705 Report faults or defects on a lubrication system • PA0706 Conduct post-diagnosis and fault-finding activities <p>PM-04-PS07: Replace lubrication components and assemble lubrication systems</p> <ul style="list-style-type: none"> • PA0701 Plan and prepare for replacing components of a lubrication system and for assembling a lubrication system • PA0702 Identify potential hazards and risks related to the job and list the appropriate responses • PA0703 Select tools, materials, equipment and lubricants 	<p>lubrication system</p> <ul style="list-style-type: none"> • AK0803 Components of a lubrication system • AK0804 Signs and causes of leaks, wear, damage, failure and defects • AK0805 Types and applications of lubrication systems <p>PM-05-PS: Do fault-finding on lubrication systems</p> <ul style="list-style-type: none"> • AK0701 Procedures to diagnose lubrication system problems • AK0702 Procedures to do fault-finding on a lubrication system • AK0703 Original Equipment Manufacturer specifications for a lubrication system • AK0704 Signs, symptoms and causes of faults on lubrication systems • AK0705 Types of lubrication system faults • AK0706 Possible corrective actions and options to repair faults <p>PM-04-PS07: Replace lubrication components and assemble lubrication systems</p> <ul style="list-style-type: none"> • AK0701 Procedures to replace lubrication system components • AK0702 Procedures to assemble a lubrication system • AK0703 Types and applications of lubrication systems and specifications • AK0704 Lubrication system components 	<p>procedures, lock out, tagging and site preparation procedures during routine maintenance</p> <ul style="list-style-type: none"> • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / conduct under supervision (WA0203) / conduct (WA0303) a range of routine maintenance tasks of varying complexity (lubrication systems) • WA0104, WA0204, WA0304: The experience must include routine maintenance lubrication systems <p>WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts (lubrication systems)</p> <ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods.
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<ul style="list-style-type: none"> • PA0704 Replace worn, damaged or defective components and parts • PA0705 Assemble, set and record lubrication component or part numbers and specifications • PA0706 Check and fill lubricant • PA0707 Conduct post-assembly activities <p>PM-06-PS 06: Repair lubrication systems</p> <ul style="list-style-type: none"> • PA0601 Read and interpret the practical assignments on specific repairs required • PA0602 Read and interpret the standard repair specifications and quality requirements from the manufacturer • PA0603 Identify components, parts, seals, lubricants and specifications of these that must be available for repair • PA0604 Plan the sequence of work to repair the lubrication system • PA0605 Identify potential hazards and risks related to the job and list the appropriate responses • PA0606 Identify, select and use the required hand tools, power tools and equipment • PA0607 Disassemble the lubrication system following the specified procedure • PA0608 Inspect components and parts and confirm required repairs • PA0609 Replace components or parts following the specified procedure • PA0610 Reassemble the lubrication 	<p>and applications</p> <ul style="list-style-type: none"> • AK0705 Types and applications of lubricants • AK0706 Environmental risks associated with lubricants <p>PM-06-PS 06: Repair lubrication systems</p> <ul style="list-style-type: none"> • AK0601 Procedures for repairing lubrication systems • AK0602 Safety practices and procedures • AK0603 Lubrication system disassembly and assembly procedures check • AK0604 Lubrication system component replacement procedures • AK0605 Lubricants, seals and parts specifications and part numbers • AK0606 Use and care of tools and equipment • AK0607 Post repair activities 	<p><u>FAULT FINDING AND REPAIRS</u></p> <p>WM-04-WE01 For a period of two weeks, assist an experienced artisan repairing faults on mechanical sub-assemblies and machines</p> <p>WM-04-WE02 Perform repairs on mechanical sub-assemblies and machines</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Observe (WA0101) / perform under supervision (WA0201) / perform (WA0301) inspection processes, safety procedures, lock out, tagging and site preparation procedures • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / perform under supervision (WA0203) / perform (WA0303) a range of mechanical fault-finding, repairs, installation and commissioning tasks (lubrication systems) • WA0104, WA0204, WA0304: The experience must include a variety of breakdowns on lubrication systems <p>WM-04-WE04 Perform repairs on mechanical machines and sub-assemblies autonomously under work</p>
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<p>system following the specified procedure</p> <ul style="list-style-type: none"> • PA0611 Check and fill lubricant if required • PA0612 Check and confirm that repairs have resolved the problem or fault • PA0613 Conduct post-repair activities 		<p>pressure conditions such as shifts (lubrication systems)</p> <ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods • Perform housekeeping as per industry standards <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling & storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications
ASSESSMENT CRITERIA		
<p>PM-03-PS08: Clean and inspect lubrication systems</p> <ul style="list-style-type: none"> • IAC0801 Procedures to clean and inspect a lubrication system are explained • IAC0802 A lubrication system is cleaned 	<p>KM-02-KT09: Mechanical working principles, types and applications of lubrication systems</p> <ul style="list-style-type: none"> • IAC0901 Classification and types of lubrication systems and devices are 	<p>Supporting Evidence</p> <p><u>ROUTINE MAINTENANCE</u> WM-02-WE01 For a period of two weeks, assist an experienced artisan</p>

<p>and inspected according to procedure</p> <ul style="list-style-type: none"> • IAC0803 Risks and hazards are identified and responded to in a responsible manner • IAC0804 Leaks, wear, damage, defects and failures on a lubrication system are identified and explained correctly • IAC0805 Lubrication system types and Original Equipment Manufacturer specifications are explained <p>PM-05-PS: Do fault-finding on lubrication systems</p> <ul style="list-style-type: none"> • IAC0701 Defects or faults on a lubrication system are identified correctly • IAC0702 Corrective actions and options are explained correctly and motivated • IAC0703 A systematic fault-finding process is followed • IAC0704 Risks and hazards are identified and responded to in a responsible manner <p>PM-04-PS07: Replace lubrication components and assemble lubrication systems</p> <ul style="list-style-type: none"> • IAC0701 Procedures to replace lubrication system components and to assemble a lubrication system are explained • IAC0702 Lubrication components are replaced according to procedures and specifications 	<p>described</p> <ul style="list-style-type: none"> • IAC0902 Properties of lubricants are discussed • IAC0903 Components of lubrication systems and devices are discussed • IAC0904 Working principles of lubrications systems and devices are discussed • IAC0905 Safety precautions pertaining to lubrication systems are explained 	<p>performing routine maintenance on mechanical sub-assemblies and machines</p> <p>WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision</p> <p>WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p> <p>WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records <p><u>FAULT FINDING AND REPAIRS</u></p> <p>WM-04-WE01 For a period of two weeks, assist an experienced artisan repairing faults on mechanical sub-assemblies and machines</p> <p>WM-04-WE02 Perform repairs on mechanical sub-assemblies and machines</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <p>WM-04-WE04 Perform repairs on mechanical machines and sub-</p>
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<ul style="list-style-type: none"> • IAC0703 A lubrication system is assembled according to procedures and Original Equipment Manufacturer specifications • IAC0704 Risks and hazards are identified and responded to in a responsible manner <p>PM-06-PS 06: Repair lubrication systems</p> <ul style="list-style-type: none"> • IAC0601 Instructions and repair specifications are interpreted correctly • IAC0602 Lubrication system components and specifications are identified correctly • IAC0603 The lubrication system is disassembled and reassembled correctly • IAC0604 Faulty components are identified and replaced correctly • IAC0605 Sequences to repair the lubrication system are followed correctly • IAC0606 Tools and equipment are identified and used correctly • IAC0607 Post repair activities are performed correctly • IAC0608 Safety requirements are met <p>PM-14-PS06: Install lubrication system components and commission lubrication systems</p> <ul style="list-style-type: none"> • IAC0601 Lubrication system components are correctly installed in terms of procedure, sequence and specifications • IAC0602 Lubrication system operation is 		<p>assemblies autonomously under work pressure conditions such as shifts</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records
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<ul style="list-style-type: none"> checked and adjusted if necessary • IAC0603 Lubrication system is commissioned as per procedure • IAC0604 Quality requirements are met • IAC0605 Safety requirements are met 		
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 30 marks (45min) and the competency will be at 80% • Practical exercise of 60min covering all above mentioned items. <ul style="list-style-type: none"> ○ Level of competency of 100% (critical) required for: <ul style="list-style-type: none"> ▪ Safety isolate, lockout and test for zero potential. ▪ Use of PPE ○ Level of competency of 80% required for all other assessment items <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material on Knowledge and Practical Skills Modules • Samples (and charts) of tolerance and Fits • Safe Operating Procedure and Safe Working Procedure • Charts of risk assessment procedure and safety measures • CDs and videos will be an added advantage <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> • Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles • Hand Tools and measuring equipment • Set of Spanners and sockets • Rubber Mallet • Screwdriver • Allen key set • Torque Wrench • Torx wrench set • Grease gun 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>K3</h1>				
		Curriculum code: 653303000						
Learning area title: Perform work activities on bearings and lubrication systems		Total hours	<table border="1"> <tr> <td>SDP</td> <td>WP</td> </tr> <tr> <td>80</td> <td>104</td> </tr> </table>		SDP	WP	80	104
SDP	WP							
80	104							
Work situation title: Perform installation and commissioning activities on lubrication systems		Total hours	<table border="1"> <tr> <td>8</td> <td>8</td> </tr> </table>	8	8			
8	8							
Work scenario: The maintenance department is busy with putting in a new production line. Sam is given the job card of putting in a new gravity feed lubrication system by the bearings. He has to perform a risk assessment and also prepare all his tools and equipment required. Sam takes the new lubrication system and installs it. After installing he has to start it up and ensure that the system works as required.								
Prerequisite learning: Year								
INTEGRATED LEARNING CONTENT								
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)					
<p>PM-07-PS06 Install lubrication system components and commission lubrication systems <i>Given practical assignments, a repaired lubrication system component, tools, personal protective equipment, specifications</i> The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0601 Read and interpret the installation and commissioning specifications and quality requirements • PA0602 Identify and select specific tools, equipment and materials required for the installation and commissioning process • PA0603 Plan the sequences for installation and commissioning • PA0604 Identify potential hazards and risks related to the job and list the appropriate responses 	<p>Knowledge of:</p> <p>KM-02-KT09 Mechanical working principles, types and applications of lubrication systems</p> <ul style="list-style-type: none"> • KT0901 Lubrication systems and devices • KT0902 Properties of lubricants • KT0903 Terminology of lubrication systems and devices • KT0904 Working principles of lubrication systems and devices <p><u>Applied Knowledge</u></p> <p>PM-07-PS06 Install lubrication system components and commission lubrication systems</p> <ul style="list-style-type: none"> • AK0601 Lubrication system installation procedures and specifications 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously [Focus: Install and commission]</p> <ul style="list-style-type: none"> • WA0301 Perform inspection processes safety procedures, lock out, tagging and site preparation procedures • WA0302 Interact with production personnel and report • WA0303 Perform installation and commissioning tasks for lubrication systems <ul style="list-style-type: none"> ○ Gather necessary technical information, develop installation and commissioning plan, list and 					

<ul style="list-style-type: none"> • PA0605 Prepare the work area for installation of the lubrication system • PA0606 Install the lubrication system to specifications • PA0607 Use tools and equipment correctly • PA0608 Follow the correct installation procedures and sequence • PA0609 Check the lubrication system installation by performing a systematic inspection of all the critical control points • PA0610 Commission the lubrication system by performing a final inspection and performance test • PA070611 Perform post installation and commissioning activities • Perform housekeeping as per industry standards 	<ul style="list-style-type: none"> • AK0602 Operation of lubrication system • AK0603 Commissioning of lubrication system • AK0604 Use of and care for tools and equipment 	<ul style="list-style-type: none"> ○ obtain required parts & materials ○ Install as per manufacturers' and workplace specifications ○ Conduct post-installation inspection and functionality tests and commission the installations ○ Complete all relevant documentation • Perform Housekeeping as per industry standards <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling & storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications
ASSESSMENT CRITERIA		
<p>PM-07-PS06 Install lubrication system components and commission lubrication systems</p> <ul style="list-style-type: none"> • Lubrication system components are correctly installed in terms of procedure, sequence and specifications • Lubrication system operation is checked and adjusted if necessary • Lubrication system is commissioned as per procedure 	<p>KM-02-KT09 Mechanical working principles, types and applications of lubrication systems</p> <ul style="list-style-type: none"> • Classification and types of lubrication systems and devices are described • Properties of lubricants are discussed • Components of lubrication systems and devices are discussed • Working principles of lubrications systems and devices are discussed 	<p>Supporting Evidence</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • SE0301 Signed-off job cards • SE0302 Non-conformance reports • SE0303 Workplace logbook or portfolio • SE0304 Equipment downtime records

<ul style="list-style-type: none"> • Quality requirements are met • Safety requirements are met 	<ul style="list-style-type: none"> • Safety precautions pertaining to lubrication systems are explained 	<ul style="list-style-type: none"> • Installation documentation
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 30 questions (15min) and the competency will be at 80% • Practical exercise of 45 min length <ul style="list-style-type: none"> ○ No injury or unsafe act had occurred ○ Correct lubrication used ○ No damage to equipment ○ Level of competence required: 100% <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material on defined Knowledge and Practical Skills Modules • Samples (and charts) of different bearings and lubrication fits and tolerance, Bearing catalogue • Safe Operating Procedure and Safe Working Procedure • Charts of risk assessment procedure and safety measures • CDs and videos will be an added advantage <p>Tools, Equipment and Materials</p> <ul style="list-style-type: none"> • Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles • Bearings, Measuring equipment, hand tools, hand press, bearing heater, bearing puller, • Lubrication systems and components 		

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>K4</h1>				
		Curriculum code: 653303000						
Learning area title: Perform work activities on bearings and lubrication systems		Total hours	<table border="1"> <tr> <td>SDP</td> <td>WP</td> </tr> <tr> <td>80</td> <td>104</td> </tr> </table>		SDP	WP	80	104
SDP	WP							
80	104							
Work situation title: Perform installation and commissioning activities on bearings		Total hours	<table border="1"> <tr> <td>16</td> <td>16</td> </tr> </table>	16	16			
16	16							
Work scenario: The maintenance department is busy with putting in a new production line. Manini is given the job card of putting in a new bearing component. He has to perform a risk assessment and also prepare all his tools and equipment required. Sam takes the new bearing component and installs it. After installing he has to start it up and ensure that the system works as per requirement.								
Prerequisite learning: Year 1								
INTEGRATED LEARNING CONTENT								
Practical skills modules (PM)		Knowledge modules (KM)		Work experience modules (WM)				
<p>QCTO none</p> <p>Install bearing components and commission</p> <p><i>Given practical assignments, a repaired bearing component, tools, personal protective equipment, specifications</i></p> <ul style="list-style-type: none"> • Read and interpret the installation and commissioning specifications and quality requirements • Identify and select specific tools, equipment and materials required for the installation and commissioning process • Plan the sequences for installation and commissioning • Identify potential hazards and risks related to the job and list the appropriate responses • Prepare the work area for installation of the bearings 		<p>Knowledge of:</p> <p>KM-02-KT02 Types, and application of bearings</p> <ul style="list-style-type: none"> • KS0201 Bearings (anti-friction and friction bearings) • KS0202 Application of bearing • KS0203 Maintenance of bearing • KS0204 Causes of failures in bearings • KS0205 Removal and installation of bearings • Tolerances off interference clearances • Bearing catalogues • Measuring equipment used and how to ensure that it is calibrated 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously [Focus: Install and commission]</p> <ul style="list-style-type: none"> • WA0301 Perform inspection processes safety procedures, lock out, tagging and site preparation procedures • WA0302 Interact with production personnel and report • WA0303 Perform installation and commissioning tasks for bearings <ul style="list-style-type: none"> ○ Gather necessary technical information, develop installation and commissioning plan, list and obtain required parts & materials ○ Install as per manufacturers' and workplace specifications 				

<ul style="list-style-type: none"> • Install the bearings system to specifications • Use tools and equipment correctly • Follow the correct installation procedures and sequence • Check the bearing installation by performing a systematic inspection of all the critical control points • Commission the bearings by performing a final inspection and performance test • Perform post installation and commissioning activities • Clearances according to specification • Correct application for correct bearing • Correct bearing identified by the number • Bearing puller correct use • Bearing heater correct use • Hydraulic hand press correct use • Perform housekeeping as per industry standards 	<p><u>Applied Knowledge</u></p> <p>Install bearing components and commission</p> <ul style="list-style-type: none"> • Bearing installation procedures and specifications • Operation of bearings • Commissioning of bearings • Use of and care for tools and equipment 	<ul style="list-style-type: none"> ○ Conduct post-installation inspection and functionality tests and commission the installations ○ Complete all relevant documentation • Perform Housekeeping as per industry standards <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling & storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications
ASSESSMENT CRITERIA		
<p>Install bearing components and commission</p> <ul style="list-style-type: none"> • Bearing system components are correctly installed in terms of procedure, sequence and specifications • Bearing operation is checked and adjusted if necessary • Bearing is commissioned as per procedure • Quality requirements are met • Safety requirements are met 	<p>KM-02-KT02 Types, and application of bearings</p> <ul style="list-style-type: none"> • Types of bearings are differentiated • Components of bearings are identified and discussed • Applications for different bearings are discussed • The causes of bearing failure are described • Removal and installation procedures for bearings are described 	<p>Supporting Evidence</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • SE0301 Signed-off job cards • SE0302 Non-conformance reports • SE0303 Workplace logbook or portfolio • SE0304 Equipment downtime records • Installation documentation

- | | | |
|--|---|--|
| | <ul style="list-style-type: none">• Safety precautions pertaining to bearings are explained | |
|--|---|--|

Internal Assessment to be performed

- Internal knowledge test of a minimum of 30 questions (60min) and the competency will be at 80%
- Practical exercise of 45 min length covering
 - No injury or unsafe act had occurred
 - No Injuries to self/co-worker and the environment or damage to equipment
 - Correct use of heater, press, puller and hydraulic jack
 - Bearing must be heated to correct temperature
 - Bearings must be removed correctly
 - Bearings must be mounted correctly
 - Bearings are mounted according to specifications (Clearances)
 - No damage to equipment
 - Level of competence required: 100%

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of different bearings and lubrication fits and tolerance, Bearing catalogue
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- CDs and videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles
- Bearings, Measuring equipment, hand tools, hand press, bearing heater, bearing puller

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		L1				
		Curriculum code: 653303000						
Learning area title: Perform work activities on hydraulic systems		Total hours	<table border="1"> <tr> <td>SDP</td> <td>WP</td> </tr> <tr> <td>184</td> <td>184</td> </tr> </table>		SDP	WP	184	184
SDP	WP							
184	184							
Work situation title: Build and test basic hydraulic flow circuits		Total hours	<table border="1"> <tr> <td>80</td> <td>80</td> </tr> </table>	80	80			
80	80							
Work scenario: Bona is tasked to build a Hydraulic System to operate a lifting platform. The Hydraulic system must conform to the parameters stipulated by the design team. The system must adhere to all safety standards and tested to perform optimally before the system is declared operable.								
Prerequisite learning: Year 1								
Practical skills modules (PM)		Knowledge modules (KM)		Work experience modules (WM)				
<p><i>QCTO none</i></p> <p>Build and test basic hydraulic circuits</p> <p><i>Given work instructions for a range of basic hydraulic circuits, related components including sensors and actuators, drawings, schematics and relevant tools,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Read and interpret symbols, diagrams and schematics and identify the related components • Describe the role and function of each component within the circuit • Interpret work instructions, select the relevant tools, equipment, components and personal protective equipment for each task, prepare the work area and conduct a risk assessment • Use all relevant personal protective equipment and apply all 		<p>Knowledge of:</p> <p>M-02-KT10: Mechanical working principles, types and applications of hydraulic systems</p> <ul style="list-style-type: none"> • KT1001 Hydraulic systems • KT1002 Units of measurement in hydraulic systems (pressure, flow rate, area) • KT1003 Hydraulic symbols and circuits <p><u>Applied Knowledge</u></p> <p>Build and test basic hydraulic circuits</p> <ul style="list-style-type: none"> • Hydraulic components and related symbols • Drawing and schematic conventions • Measurement and testing methods and techniques • Typical hydraulic faults • Removal and replacement techniques 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>Build and test basic hydraulic flow circuits</p> <ul style="list-style-type: none"> • Read and interpret symbols, diagrams and schematics and identify the related components • Build and test basic hydraulic circuits • Remove, test and replace hydraulic components • Identify typical hydraulic faults <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities 				

<p>relevant health, safety and environmental precautions</p> <ul style="list-style-type: none"> • Build and test basic hydraulic circuits • Remove, test and replace hydraulic components • Identify typical hydraulic faults • Care for tools and equipment and clean and restore the work area 	<ul style="list-style-type: none"> • Typical hazards and safety, health and environment related risks • Applicable safety, health and environmental requirements and practices 	<ul style="list-style-type: none"> • Work records • Original Equipment Manufacturer manuals and specifications
ASSESSMENT CRITERIA		
<p>Build and test basic hydraulic circuits</p> <ul style="list-style-type: none"> • Circuits are assembled correctly and meet specifications • All faults are identified and corrected • All components and symbols are identified correctly and their role and function correctly described • All tools and equipment are correctly and safely used and cared for • IAC0105 Safe working practices are applied • Components are correctly handled and tested 	<p>M-02-KT10: Mechanical working principles, types and applications of hydraulic systems</p> <ul style="list-style-type: none"> • Components and functions of hydraulic systems are identified and described • Units of measurement in hydraulic systems are calculated • Hydraulic symbols and circuits are read and interpreted • Safety precautions pertaining to hydraulic systems are explained 	<p>WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines</p> <ul style="list-style-type: none"> • SE0101 Signed-off job cards • SE0102 Non-conformance reports • SE0103 Workplace logbook or portfolio • SE0104 Equipment downtime records <p>WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • SE0301 Signed-off job cards • SE0302 Non-conformance reports • SE0303 Workplace logbook or portfolio • SE0304 Equipment downtime records
<p>Internal Assessment to be performed:</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 15 questions (30 min) and the competency will be at 80% • Practical exercise of 60min length covering all associated tasks and procedures. <ul style="list-style-type: none"> ○ No injury or unsafe act had occurred ○ Interpret symbols and abbreviations. ○ Interpret elementary hydraulic circuit diagrams. ○ Identify the following hydraulic fluids: 		

- petroleum based
- emulsion based
- Install and maintain the following filters:
 - suction
 - pressure
 - return
- Install and maintain hydraulic tubing and fittings.
- Install and maintain flexible hydraulic hoses and fittings.
- All safety aspects adhered to according company policies
- No damage to equipment
- Take readings off pressure and flow meters

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of Hydraulic Fluids, Valves and power packs
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- CDs and videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment;: Overalls; Safety Boots; Safety Goggles
- Hydraulic basic Simulation stand and equipment
- Tools include but not limited to: Spanner set, Allen key set, screw drivers, Flow and Pressure Gauges,

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>L2</h1>	
		Curriculum code: 653303000			
Learning area title: Perform work activities on hydraulic systems		Total hours	SDP		WP
			184		184
Work situation title: Perform routine maintenance, fault finding, repair and reassembly activities on hydraulic systems		Total hours	40	40	
Work scenario: Mona is tasked with routine maintenance on a beneficiation plant. The Hydraulic system forms part of the weekly schedule which need to be inspected to ensure optimal performance for the shift. She has a list of hydraulic components that require replacing. The system must conform to OEM standard after he has completed replacing all the items on the list and the system is declared operable.					
Prerequisite learning: L1					
INTEGRATED LEARNING CONTENT					
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)		
<p>PM-03-PS09 Clean and inspect a hydraulic system <i>Given a selection of simple hydraulic systems including the power pack, relevant drawings, tools, personal protective equipment, specifications, cleaning materials and solvents,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0901 Plan and prepare for cleaning and inspecting a hydraulic system • PA0902 Identify potential hazards and risks related to the job and list the appropriate responses • PA0903 Read and interpret hydraulic diagrams • PA0904 Select tools and cleaning materials • PA0905 Clean a hydraulic system • PA0906 Visually inspect a hydraulic system for leaks, wear, damage, 	<p>Knowledge of:</p> <p>KM-02-KT10: Mechanical working principles, types and applications of hydraulic systems</p> <ul style="list-style-type: none"> • KT1001 Hydraulic systems • KT1002 Units of measurement in hydraulic systems (pressure, flow rate, area) • KT1003 Hydraulic symbols and circuits • Cleaning of system • Heat detection • Power-pack systems • Baffle-plate • Breather <p>Applied Knowledge</p> <p>PM-03-PS09: Clean and inspect hydraulic systems</p> <ul style="list-style-type: none"> • AK0901 Procedures to clean and inspect 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p><u>ROUTINE MAINTENANCE</u></p> <p>WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines</p> <p>WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision</p> <p>WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Observe (WA0101) / conduct under supervision (WA0201) / conduct 		

<p>defects, and failures according to Original Equipment Manufacturer specifications</p> <ul style="list-style-type: none"> • PA0907 Conduct post-cleaning and inspecting activities • Housekeeping executed according to Industry standards <p>PM-05-PS08: Do fault-finding on hydraulic systems <i>Given practical assignments, hydraulic systems including the power pack, tools, diagnostic equipment, hydraulic circuit diagrams, personal protective equipment and specifications,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0801 Identify potential hazards and risks related to the job and list the appropriate responses • PA0802 Visually inspect or assess hydraulic system condition • PA0803 Identify possible faults • PA0804 Determine corrective actions and options for dealing with identified faults • PA0805 Report faults or defects on a hydraulic system • PA0806 Conduct post-diagnosis and fault-finding activities <p>PM-06-PS 07: Repair hydraulic systems <i>Given a faulty hydraulic system including the power pack, replacement components, lubricants, diagnostic information, sequence</i></p>	<p>hydraulic systems</p> <ul style="list-style-type: none"> • AK0902 Original Equipment Manufacturer specifications for a hydraulic system • AK0903 Components of a hydraulic system • AK0904 Signs and causes of leaks, wear, damage, failure and defects • AK0905 Types and applications of hydraulic systems <p>PM-05-PS08: Do fault-finding on hydraulic systems</p> <ul style="list-style-type: none"> • AK0801 Procedures to diagnose hydraulic system problems • AK0802 Procedures to do fault-finding on a hydraulic system • AK0803 Original Equipment Manufacturer specifications for a hydraulic system • AK0804 Signs, symptoms and causes of faults on hydraulic systems • AK0805 Types of hydraulic system faults • AK0806 Possible corrective actions and options to repair faults <p>PM-11-PS07: Repair hydraulic systems</p> <ul style="list-style-type: none"> • AK0701 Procedures for repairing hydraulic systems • AK0702 Safety practices and procedures • AK0703 Hydraulic system disassembly and assembly procedures • AK0704 Hydraulic system component replacement procedures • AK0705 Lubricants, seals and parts 	<p>(WA0301) inspection processes, safety procedures, lock out, tagging and site preparation procedures during routine maintenance</p> <ul style="list-style-type: none"> • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / conduct under supervision (WA0203) / conduct (WA0303) a range of routine maintenance tasks of varying complexity • WA0104, WA0204, WA0304: The experience must include routine maintenance on hydraulic systems <p>WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts (hydraulic systems)</p> <ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods.
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<p><i>of work, specifications, tools and personal protective equipment,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0701 Read and interpret the practical assignments on specific repairs required • PA0702 Read and interpret the standard repair specifications and quality requirements from the manufacturer • PA0703 Identify components, parts, seals, lubricants and specifications of these that must be available for repair • PA0704 Plan the sequence of work to repair the hydraulic system • PA0705 Identify potential hazards and risks related to the job and list the appropriate responses • PA0706 Identify, select and use the required hand tools, power tools and equipment • PA0707 Disassemble the hydraulic system following the specified procedure • PA0708 Inspect components and parts and confirm required repairs • PA0709 Replace components or parts following the specified procedure • PA0710 Check and fill hydraulic fluids if required • PA0711 Check and confirm that repairs have resolved the problem or fault • PA0712 Conduct post-repair activities 	<p>specifications and part numbers</p> <ul style="list-style-type: none"> • AK0706 Use and care of tools and equipment • AK0707 Post repair activities <p>PM-04-PS08: Replace hydraulic components and assemble hydraulic systems</p> <ul style="list-style-type: none"> • AK0801 Procedures to replace hydraulic system components • AK0802 Procedures to assemble a hydraulic system • AK0803 Applications of hydraulic systems and specifications • AK0804 Hydraulic system components and applications • AK0805 Types and applications of hydraulic fluids <p>PM-08-PS03 Overhaul a mechanical machine that incorporates a hydraulic and pneumatic system</p> <ul style="list-style-type: none"> • AK080301 Manufacture specifications • AK080302 Overhauling procedures 	<p><u>FAULT FINDING AND REPAIRS</u></p> <p>WM-04-WE01 For a period of two weeks, assist an experienced artisan repairing faults on mechanical sub-assemblies and machines</p> <p>WM-04-WE02 Perform repairs on mechanical sub-assemblies and machines</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Observe (WA0101) / perform under supervision (WA0201) / perform (WA0301) inspection processes, safety procedures, lock out, tagging and site preparation procedures • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / perform under supervision (WA0203) / perform (WA0303) a range of mechanical fault-finding, repairs, installation and commissioning tasks • WA0104, WA0204, WA0304: The experience must include a variety of breakdowns on hydraulic systems <p>WM-04-WE04 Perform repairs on mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts</p>
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<p>PM-04-PS08: Replace hydraulic components and assemble hydraulic systems <i>Given a selection of various hydraulic systems and components including the power pack, relevant tools, hydraulic circuit diagrams, personal protective equipment, specifications and material,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0801 Plan and prepare for replacing hydraulic system components and assembling a hydraulic system • PA0802 Identify potential hazards and risks related to the job and list the appropriate responses • PA0803 Select tools, materials, equipment and hydraulic fluids • PA0804 Replace worn, damaged or defective components and parts • PA0805 Assemble, set and record hydraulic component or part numbers and specifications • PA0806 Check and fill hydraulic fluids • PA0807 Conduct post-assembly activities • Housekeeping executed according to Industry standards <p>PM-08-PS03 Overhaul a mechanical machine that incorporates a hydraulic and pneumatic system <i>Given used machines that incorporates a hydraulic and pneumatic system, worn components, tools, access to everything</i></p>		<ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods. <p><u>OVERHAULING (hydraulic systems)</u> WM-05-WE01: For a period of two weeks, assist an experienced artisan overhauling mechanical sub-assemblies and machines WM-05-WE02: Overhaul a range mechanical machines and sub-assemblies under supervision WM-05-WE03: Overhaul a range mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Observe (WA0101) / perform under supervision (WA0201) / perform (WA0301) overhaul planning processes and pre-overhauling inspection procedures • Observe and assist with (WA0103) / perform under supervision (WA0203) / perform (WA0303) a range of overhauling tasks
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<p><i>needed to overhaul the machine, personal protective equipment, specifications</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA080301 Identify and select specific tools, equipment and materials required for the overhaul process • PA080302 Identify potential hazards and risks related to the job and list the appropriate responses • PA080303 Disassemble the machine and prepare the components for inspection • PA080304 Inspect the components and draw up a material and replacement parts list • PA080305 Replace all worn parts to specification • PA080306 Assemble and restore the machine to conform to the service tolerances specified in the manufacturer specifications • PA080307 Perform post overhauling activities • Perform Housekeeping as per industry standards 		<ul style="list-style-type: none"> • WA0103 The experience must include a variety of overhauling projects on hydraulic systems <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications
ASSESSMENT CRITERIA		
<p>PM-03-PS09: Clean and inspect hydraulic systems</p> <ul style="list-style-type: none"> • IAC0901 Procedures to clean and inspect a hydraulic system are explained • IAC0902 A hydraulic system is cleaned and inspected according to procedure • IAC0903 Risks and hazards are identified and responded to in a responsible manner 	<p>KM-02-KT10: Mechanical working principles, types and applications of hydraulic systems</p> <ul style="list-style-type: none"> • Components and functions of hydraulic systems are identified and described • Units of measurement in hydraulic systems are calculated • Hydraulic symbols and circuits are read and interpreted 	<p>Supporting Evidence</p> <p><u>ROUTINE MAINTENANCE</u></p> <p>WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines</p>

<ul style="list-style-type: none"> • IAC0904 Leaks, wear, damage, defects and failures on a hydraulic system are identified and explained correctly • IAC0905 Hydraulic system types and Original Equipment Manufacturer specifications are explained <p>PM-05-PS08: Do fault-finding on hydraulic systems</p> <ul style="list-style-type: none"> • IAC0801 Defects or faults on a hydraulic system are identified correctly • IAC0802 Corrective actions and options are explained correctly and motivated • IAC0803 A systematic fault-finding process is followed • IAC0804 Risks and hazards are identified and responded to in a responsible manner <p>PM-06-PS 07: Repair hydraulic systems IAC0701 Instructions and repair specifications are interpreted correctly</p> <ul style="list-style-type: none"> • IAC0702 Hydraulic system components and specifications are identified correctly • IAC0703 The hydraulic system is disassembled and reassembled correctly • IAC0704 Faulty components are identified and replaced correctly • IAC0705 Sequences to repair the hydraulic system are followed correctly • IAC0706 Tools and equipment are identified and used correctly • IAC0707 Post repair activities are performed correctly 	<ul style="list-style-type: none"> • Safety precautions pertaining to hydraulic systems are explained 	<p>WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision</p> <p>WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p> <p>WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records <p><u>FAULT FINDING AND REPAIRS</u></p> <p>WM-04-WE01 For a period of two weeks, assist an experienced artisan repairing faults on mechanical sub-assemblies and machines</p> <p>WM-04-WE02 Perform repairs on mechanical sub-assemblies and machines</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <p>WM-04-WE04 Perform repairs on mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports
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<ul style="list-style-type: none"> • IAC0708 Safety requirements are met <p>PM-04-PS08: Replace hydraulic components and assemble hydraulic systems</p> <ul style="list-style-type: none"> • IAC0801 Procedures to replace hydraulic system components and assemble a hydraulic system are explained • IAC0802 Hydraulic components are replaced according to procedures and specifications • IAC0803 A hydraulic system is assembled according to procedures and Original Equipment Manufacturer specifications • IAC0804 Risks and hazards are identified and responded to in a responsible manner <p>PM-08-PS03 Overhaul a mechanical machine that incorporates a hydraulic and pneumatic system</p> <ul style="list-style-type: none"> • Safety requirements are met • Overhauling specifications and quality requirements are explained accurately • Tools, equipment, materials and parts are identified and described correctly • The sequence of activities to overhaul the machine is adhered to • The final product meets service tolerances specified in the manufacturer specifications 		<ul style="list-style-type: none"> • Workplace logbook or portfolio • Equipment downtime records <p><u>OVERHAULING</u></p> <p>WM-05-WE01: For a period of two weeks, assist an experienced artisan overhauling mechanical sub-assemblies and machines</p> <p>WM-05-WE02: Overhaul a range mechanical machines and sub-assemblies under supervision</p> <p>WM-05-WE03: Overhaul a range mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio
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Internal Assessment to be performed

- Internal knowledge test of a minimum of 15 questions (30 min) and the competency will be at 80%
- Practical exercise of 60min length covering all associated tasks and procedures.
 - No injury or unsafe act had occurred
 - Interpret symbols and abbreviations.
 - Interpret elementary hydraulic circuit diagrams.
 - Identify the following hydraulic fluids:
 - petroleum based
 - emulsion based
 - Install and maintain the following filters:
 - suction
 - pressure
 - return
 - Install and maintain hydraulic tubing and fittings.
 - Install and maintain flexible hydraulic hoses and fittings.
 - Identify the following hydraulic pumps - vane, gear, piston.
 - Install and maintain hydraulic pumps.
 - Service procedures of reservoir.
 - Install and maintain directional control, pressure and flow control valves.
 - Install and maintain hydraulic cylinders.
 - Identify and install accumulators.
 - Diagnose faults in basic hydraulic systems.
 - No damage to equipment

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of Hydraulic Fluids, Valves and power packs
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- Videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment; e.g. Overalls; Safety Boots; Safety Goggles
- Hydraulic basic Simulation stand and equipment
- Tools include but not limited to: Spanner set, Allen key set, screw drivers, Flow and Pressure Gauges

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		L3
		Curriculum code: 653303000		
Learning area title: Perform work activities on hydraulic systems	Total hours	SDP	WP	
		184	184	
Work situation title Perform installation and commissioning activities on hydraulic systems	Total hours	24	24	
Work scenario: Phumi is tasked with the new installation of the power pack that will be driving the furnace hydraulics. She has to connect the pipes according to the hydraulic diagram, fill up the system and bleed the air out. After the installation she has to test the system and ensure that there is no leaks and everything is working according to sequence.				
Prerequisite learning: L2				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-07-PS07 Install hydraulic system components and commission hydraulic systems <i>Given practical assignments, a repaired hydraulic system component, tools, personal protective equipment, specifications</i> The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0701 Read and interpret the installation and commissioning specifications and quality requirements • PA0702 Identify and select specific tools, equipment and materials required for the installation and commissioning process • PA0703 Plan the sequences for installation and commissioning • PA0704 Identify potential hazards and risks related to the job and list the appropriate responses 	<p>Knowledge of:</p> <p>KM-02-KT10 Mechanical working principles, types and applications of hydraulic systems</p> <ul style="list-style-type: none"> • KT1001 Hydraulic systems • KT1002 Units of measurement in hydraulic systems (pressure, flow rate, area) • KT1003 Hydraulic symbols and circuits <ul style="list-style-type: none"> • Ensuring no cavitation • Adjusting the relief valve • Accumulator • Time delays • Farrell's/olives <p><u>Applied Knowledge</u></p>		<p>The apprentice will be expected to gain The practical experience (engage) in the following work activities:</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously [Focus: Install, align and commission]</p> <ul style="list-style-type: none"> • WA0301 Perform inspection processes safety procedures, lock out, tagging and site preparation procedures • WA0302 Interact with production personnel and report • WA0303 Perform installation and commissioning tasks for hydraulic systems <ul style="list-style-type: none"> ○ Gather necessary technical information, develop installation and commissioning plan, list and 	

<ul style="list-style-type: none"> • PA0705 Prepare the work area for installation of the hydraulic system • PA0706 Install the lubrication system to specifications • PA0707 Use tools and equipment correctly • PA0708 Follow the correct installation procedures and sequence • PA0709 Check the hydraulic system installation by performing a systematic inspection of all the critical control points • PA0711 Perform post installation and commissioning activities • Use correct Hydraulic fitting fittings • Install steel pipes • Perform Housekeeping as per industry standards 	<p>PM-07-PS07 Install hydraulic system components and commission hydraulic systems</p> <ul style="list-style-type: none"> • AK0701 Installation of hydraulic system components • AK0702 Operation of hydraulic system • AK0703 Commissioning of hydraulic system • AK0704 Use of and care for tools and equipment 	<ul style="list-style-type: none"> ○ obtain required parts & materials ○ Install as per manufacturers' and workplace specifications ○ Conduct post-installation inspection and functionality tests and commission the installations ○ Complete all relevant documentation • Perform Housekeeping as per industry standards <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling & storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications
ASSESSMENT CRITERIA		
<p>PM-07-PS07 Install hydraulic system components and commission hydraulic systems</p> <ul style="list-style-type: none"> • Hydraulic system components are correctly installed in terms of procedure, sequence and specifications • Hydraulic system operation is checked and adjusted if necessary • Hydraulic system is commissioned as per procedure 	<p>KM-02-KT10 Mechanical working principles, types and applications of hydraulic systems</p> <ul style="list-style-type: none"> • Components and functions of hydraulic systems are identified and described • Units of measurement in hydraulic systems are calculated • Hydraulic symbols and circuits are read and interpreted 	<p>Supporting Evidence</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • SE0301 Signed-off job cards • SE0302 Non-conformance reports • SE0303 Workplace logbook or portfolio • SE0304 Equipment downtime records

<ul style="list-style-type: none"> • Quality requirements are met • Safety requirements are met 	<ul style="list-style-type: none"> • Safety precautions pertaining to hydraulic systems are explained 	<ul style="list-style-type: none"> • Installation documentation
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 10 questions (30 min) and the competency will be at 80% • Practical exercise of 45 min length <ul style="list-style-type: none"> ○ No injury or unsafe act had occurred ○ No Injuries to self/co-worker and the environment or damage to equipment ○ Interpret symbols and abbreviations. ○ Interpret elementary hydraulic circuit diagrams. ○ Identify the following hydraulic fluids: <ul style="list-style-type: none"> ▪ petroleum based ▪ emulsion based ○ Install and maintain the following filters: <ul style="list-style-type: none"> ▪ suction ▪ pressure ▪ return ○ Install and maintain hydraulic tubing and fittings. ○ Install and maintain flexible hydraulic hoses and fittings. ○ Identify the following hydraulic pumps - vane, gear, piston. ○ Install and maintain hydraulic pumps. ○ Service procedures of reservoir. ○ Install and maintain directional control, pressure and flow control valves. ○ Install and maintain hydraulic cylinders. ○ Identify and install accumulators. ○ Diagnose faults in basic hydraulic systems. ○ Construct the circuit shown on hydraulic diagram to adjust the relief valve ○ Systematically test the circuit with pressure gauges and flow meters to detect the fault introduced by the assessor after he has checked the circuit. ○ Comply with all safety standards ○ The relief valves must be adjusted so that the circuit will operated at the required pressures within the limit of specification ○ The fluid flow must be tested at the point/s indicated on the diagram and recorded correctly within the limits of specified litre per minute 		

- The sequence valves must be adjusted that the system operates at the required sequence.
- All safety aspects adhered to according company policies

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of hydraulic valves and equipment and diagrams
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- CDs and videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles
- Intermediate hydraulic simulation with valves, pipes and cylinders

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		L4
		Curriculum code: 653303000		
Learning area title: Perform work activities on hydraulic systems	Total hours	SDP	WP	
		184	184	
Work situation title: Perform basic activities on electro hydraulic systems (ELECTIVE)	Total hours	40	40	
Work scenario: Piet has to work on the electro-hydraulic circuit for the packing line at Cokakola. He has to be able to read the hydraulic diagram and follow the system to ensure that everything is working according to the required sequence.				
Prerequisite learning: L3				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>QCTO none</p> <p><i>Given Electro-hydraulic simulation with valves, pipes and cylinders</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> Explain the operation of a Hydraulic system by identifying and describing the functions of its main components Components include compressor, valves, actuator, cylinder and exhaust. Illustrate the use of Hydraulics in a factory through examples Symbols used in Hydraulics are identified and the functions of the components that they represent are discussed. Sensors are discussed as input elements and the different types of sensors are described. Sensors include proximity sensor, photoelectric sensor and limit switch. 	<p>Knowledge of:</p> <p>KM-02-KT10 Mechanical working principles, types and applications of hydraulic systems</p> <ul style="list-style-type: none"> KT1001 Hydraulic systems KT1002 Units of measurement in hydraulic systems (pressure, flow rate, area) KT1003 Hydraulic symbols and circuits <ul style="list-style-type: none"> The principles of Hydraulics The concept of Hydraulics in terms of its history and modern usage The operation of a Hydraulic system by identifying and describing the functions of its main components The physical principles of hydraulics are explained using Pascal's Law and Bernoulli's principle. The term hydraulics is defined in terms of related concepts 		<p>QCTO none</p> <p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <ul style="list-style-type: none"> Assist a competent person in working on an Electro-hydraulic system Perform housekeeping as per industry standards <p>Contextualised Workplace Knowledge</p> <ul style="list-style-type: none"> Workplace Hazard Inspection and Risk Assessment procedures Material request & storage procedures Equipment handling and storage procedures Standard operating procedures Reporting channels and delegated responsibilities Work records Original Equipment Manufacturer manuals and specifications 	

<ul style="list-style-type: none"> • The use of directional and non-return control valves is discussed with examples. • Check valves, junction elements (AND Valve and OR Valve). • Directional valves are discussed in term of their symbols and lettering. • Valve actuation is discussed in relation to the various categories. • The categories include manual, mechanical, pressure and electricity. • Control by Hydraulic control elements is explained using examples. • Control elements include flow control valves, pressure regulating valves, pressure limiting valves, safety valves, sequencing valves and time delay valves. • Final control by Hydraulic actuators is discussed with examples • Hydraulic related quantities are determined using calculations • Hydrostatic pressure is explained using a formula. • Hydraulic fluids are discussed in terms of their purpose and physical characteristics. • Various related hydraulic quantities are determined by calculation. • Hydraulic quantities include power transmission, displacement transmission, pressure transfer and flow rate. • The power supply system of hydraulic applications is explained using formulae. 	<ul style="list-style-type: none"> • Related concepts include hydro-mechanics, hydro-statics, and hydrodynamics. 	
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<ul style="list-style-type: none">• Valves include directional control valves, non-return valves, flow control valves and pressure relief valve.• Directional valves are discussed in term of their symbols and lettering.• Non-return valves are discussed in terms of their types.• Types include pilot controlled valves, pressure relief valves and restrictor valve.• Hydraulic cylinders and hydraulic motors are discussed in terms of their function and construction• The interactions of hydraulic elements are explained through their various applications• Troubleshoot the hydraulic system• Causes and effects of malfunctions on hydraulic systems are discussed in terms of their implications.• A circuit diagram of the hydraulic system is read and interpreted in order to identify the fault.• Various diagnostic charts are used to identify and resolve the problem.• Maintenance, troubleshooting and commissioning activities are performed in accordance with procedure.• All work is performed with due regard for and adherence to safety practices.• Multiple actuator circuits/cascade systems are connected and tested to see if they function according to the flow chart.		
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<ul style="list-style-type: none"> • Explain the design and construction of basic hydraulic circuitry. • Hydraulic control and function diagrams are developed for various applications. • The construction and purpose of the related hydraulic accessories are discussed in terms of their functions. • Various hydraulic circuit applications are connected and tested according to procedure. • Perform housekeeping as per industry standards 		
ASSESSMENT CRITERIA		
	<p>KM-02-KT10 Mechanical working principles, types and applications of hydraulic systems</p> <ul style="list-style-type: none"> • Components and functions of hydraulic systems are identified and described • Units of measurement in hydraulic systems are calculated • Hydraulic symbols and circuits are read and interpreted • Safety precautions pertaining to hydraulic systems are explained 	<p>Supporting Evidence</p> <ul style="list-style-type: none"> • Signed-off PoE/logbook
<p>Internal Assessment to be performed:</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 50 questions (60 min) and the competency will be at 80% • Practical exercise of 1H30 length <ul style="list-style-type: none"> ○ No injury or unsafe act had occurred ○ No Injuries to self/co-worker and the environment or damage to equipment 		

- All safety aspects adhered to according company policies
- No injury or damage to equipment

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of hydraulic valves and equipment and diagrams
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- CDs and videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles
- Electro-hydraulic simulation with valves, pipes and cylinders

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>M1</h1>				
		Curriculum code: 653303000						
Learning area title: Perform work activities on pneumatic systems		Total hours	<table border="1"> <tr> <td>SDP</td> <td>WP</td> </tr> <tr> <td>208</td> <td>160</td> </tr> </table>		SDP	WP	208	160
SDP	WP							
208	160							
Work situation title: Build and test basic pneumatic circuits		Total hours	<table border="1"> <tr> <td>64</td> <td>56</td> </tr> </table>	64	56			
64	56							
Work scenario: Jona is tasked to build a pneumatic system to operate a Transfer chute. The Pneumatic system must conform to the parameters stipulated by the design team. The system must adhere to all safety standards and tested to perform optimally before the system is declared operable.								
Prerequisite learning: Year 1								
INTEGRATED LEARNING CONTENT								
Practical skills modules (PM)	Knowledge modules (KM)	Work experience modules (WM)						
<p>Build and test basic pneumatic circuits <i>Given work instructions for a range of basic pneumatic circuits, related components, drawings, schematics, relevant tools and equipment,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Read and interpret symbols, diagrams and schematics and identify the related components • Describe the role and function of each component within the circuit • Interpret work instructions, select the relevant tools, equipment, components and personal protective equipment for each task, prepare the work area and conduct a risk assessment • Use all relevant personal protective equipment and apply all relevant health, safety and environmental precautions 	<p>Knowledge of:</p> <p>KM-02-KT11: Mechanical working principles, types and applications of pneumatic systems</p> <ul style="list-style-type: none"> • KT1101 Pneumatic systems • KT1102 Units of measurement in pneumatic systems (pressure, flow rate, area) • KT1103 Pneumatic symbols and circuits • KT1104 Safety precautions pertaining to pneumatic systems are explained <p>Applied Knowledge</p> <p>Build and test basic pneumatic circuits</p> <ul style="list-style-type: none"> • Pneumatic components and related symbols • Drawing and schematic conventions • Measurement and testing methods and techniques • Typical pneumatic faults 	<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p>Build and test basic pneumatic circuits</p> <ul style="list-style-type: none"> • Read and interpret symbols, diagrams and schematics and identify the related components • Build and test basic pneumatic circuits • Remove, test and replace pneumatic components • Identify typical pneumatic faults <p>Contextualised Workplace Knowledge</p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities 						

<ul style="list-style-type: none"> • Build and test basic pneumatic circuits • Identify and correct faults • Remove, test and replace pneumatic components • Care for tools and equipment and clean and restore the work area 	<ul style="list-style-type: none"> • Removal and replacement techniques • Typical hazards and safety, health and environment related risks • Applicable safety, health and environmental requirements and practices 	<ul style="list-style-type: none"> • Work records • Original Equipment Manufacturer manuals and specifications
ASSESSMENT CRITERIA		
<p>Build and test basic pneumatic circuits</p> <ul style="list-style-type: none"> • Circuits are assembled correctly and meet specifications • All components and symbols are identified correctly and their role and function correctly described • All faults identified and corrected • All tools and equipment are correctly and safely used and cared for • Safe working practices are applied • Components are correctly handled and tested 	<p>KM-04-KT11: Mechanical working principles, types and applications of pneumatic systems</p> <ul style="list-style-type: none"> • Components and functions of pneumatic systems are identified and described • Units of measurement in pneumatic systems are described • Pneumatic symbols and circuits are read and interpreted • Safety precautions pertaining to pneumatic systems are explained 	<p>Supporting Evidence:</p> <p>WM-04-WE02 Perform repairs on a range mechanical machines and sub-assemblies under supervision</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records
<p>Internal Assessment to be performed:</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 15 questions (30 min) and the competency will be at 80% • Practical exercise of 45min length covering all associated tasks and procedures. <ul style="list-style-type: none"> ○ No injury or unsafe act had occurred ○ Interpret symbols and abbreviations. ○ Interpret elementary Pneumatic circuit diagrams. ○ Install and maintain Pneumatic tubing and fittings. ○ Install and maintain flexible hoses and fittings. ○ All safety aspects adhered to according company policies ○ Damage to equipment 		

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of Pneumatic Valves and power packs
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- Videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles
- Pneumatic basic Simulation stand and equipment
- Spanners set
- Allen key set
- Screw driver
- Pipe wrench
- Pipe cutter
- Hacksaw
- Valves and fittings
- Tape measure
- Smooth half round file

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>M2</h1>
		Curriculum code: 653303000		
Learning area title: Perform work activities on pneumatic systems	Total hours	SDP	WP	
		208	160	
Work situation title: Perform routine maintenance, fault finding, repair and reassembly activities on pneumatic systems	Total hours	40	40	
Work scenario: Daniel is tasked with routine maintenance on a transfer plant. The pneumatic system forms part of the daily inspection schedule to ensure optimal performance for the shift. He is also tasked with the necessary repairs. After disassembly he inspects the barrel for any scorch marks and the piston shaft for any damage. The piston seals and the neck seals on the pneumatic cylinder are replaced. After reassembly he performs the necessary tests. The system must conform to OEM standard and all prescribed tasks must be executed before the system is declared operable.				
Prerequisite learning: M1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>PM-03-PS10: Clean and inspect pneumatic systems <i>Given a selection of simple pneumatic systems, relevant drawings, tools, personal protective equipment, specifications, cleaning materials and solvents,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> PA1001 Plan and prepare for cleaning and inspecting a pneumatic system PA1002 Identify potential hazards and risks related to the job and list the appropriate responses PA1003 Read and interpret pneumatic diagrams PA1004 Select tools and cleaning materials PA1005 Clean a pneumatic system 	<p>Knowledge of:</p> <p>KM-02-KT11: Mechanical working principles, types and applications of pneumatic systems</p> <ul style="list-style-type: none"> KT1101 Pneumatic systems KT1102 Units of measurement in pneumatic systems (pressure, flow rate, area) KT1103 Pneumatic symbols and circuits KT1104 Safety precautions pertaining to pneumatic systems are explained <p>KM-02-KT13 Diagnostic techniques</p> <ul style="list-style-type: none"> KT1301 Diagnostic equipment KT1302 Diagnostic techniques KT1303 Diagnostic testing Basic knowledge of compressor 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p><u>ROUTINE MAINTENANCE</u> WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p>	

<ul style="list-style-type: none"> • PA1006 Visually inspect a pneumatic system for leaks, wear, damage, defects, and failures according to Original Equipment Manufacturer specifications • PA1007 Conduct post-cleaning and inspecting activities • Housekeeping executed according to industry standard <p>PM-05-PS09: Do fault-finding on pneumatic systems <i>Given a practical assignment, pneumatic system, tools, diagnostic equipment, pneumatic circuit diagrams, personal protective equipment and specifications,</i></p> <p>The apprentice must be able to: PA0901 Identify potential hazards and risks related to the job and list the appropriate responses</p> <ul style="list-style-type: none"> • PA0902 Visually inspect or assess pneumatic system condition • PA0903 Identify possible faults • PA0904 Determine corrective actions and options for dealing with identified faults • PA0905 Report faults or defects on pneumatic system • PA0906 Conduct post-diagnosis and fault-finding activities <p>PM-06-PS 08: Repair pneumatic systems <i>Given a faulty pneumatic system, replacement components, lubricants, diagnostic information, sequence of work,</i></p>	<p><u>Applied Knowledge</u></p> <p>PM-03-PS10: Clean and inspect pneumatic systems</p> <ul style="list-style-type: none"> • AK1001 Procedures to clean and inspect pneumatic systems • AK1002 Original Equipment Manufacturer specifications for a pneumatic system • AK1003 Components of a pneumatic system • AK1004 Signs and causes of leaks, wear, damage, failure and defects • AK1005 Types and applications of pneumatic systems <p>PM-05-PS09: Do fault-finding on pneumatic systems</p> <ul style="list-style-type: none"> • AK0901 Procedures to diagnose pneumatic system problems • AK0902 Procedures to do fault-finding on a pneumatic system • AK0903 Original Equipment Manufacturer specifications for a pneumatic system • AK0904 Signs, symptoms and causes of faults on pneumatic systems • AK0905 Types of pneumatic system faults • AK0906 Possible corrective actions and options to repair faults 	<ul style="list-style-type: none"> • Observe (WA0101) / conduct under supervision (WA0201) / conduct (WA0301) inspection processes, safety procedures, lock out, tagging and site preparation procedures during routine maintenance • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / conduct under supervision (WA0203) / conduct (WA0303) a range of routine maintenance tasks of varying complexity (pneumatic system) • WA0104, WA0204, WA0304: The experience must include routine maintenance pneumatic system <p>WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts (pneumatic system)</p> <ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high
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<p><i>specifications, tools and personal protective equipment,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0801 Read and interpret the practical assignments on specific repairs required • PA0802 Read and interpret the standard repair specifications and quality requirements from the manufacturer • PA0803 Identify components, parts, seals, lubricants and specifications of these that must be available for repair • PA0804 Plan the sequence of work to repair the pneumatic system • PA0805 Identify potential hazards and risks related to the job and list the appropriate responses • PA0806 Identify, select and use the required hand tools, power tools and equipment • PA0807 Disassemble the pneumatic system following the specified procedure • PA0808 Inspect components and parts and confirm required repairs • PA0809 Replace components or parts following the specified procedure • PA0810 Reassemble the pneumatic system following the specified procedure • PA0811 Check and confirm that repairs have resolved the problem or fault • PA0812 Conduct post-repair activities 	<p>PM-06-PS 08: Repair pneumatic systems</p> <ul style="list-style-type: none"> • AK0801 Procedures for repairing pneumatic systems • AK0802 Safety practices and procedures • AK0803 Pneumatic system disassembly and assembly procedures • AK0804 Pneumatic system component replacement procedures • AK0805 Lubricants, seals and parts specifications and part numbers • AK0806 Use and care of tools and equipment • AK0807 Post repair activities <p>PM-04-PS09: Replace pneumatic components and assemble pneumatic systems</p> <ul style="list-style-type: none"> • AK0901 Procedures to replace pneumatic system components • AK0902 Procedures to assemble a pneumatic system • AK0903 Types and applications of pneumatic systems and specifications • AK0904 Pneumatic system components and application <p>PM-08-PS03 Overhaul a mechanical machine that incorporates a hydraulic and pneumatic system</p> <ul style="list-style-type: none"> • AK080301 Manufacture specifications • AK080302 Overhauling procedures 	<p>work volumes, peak production periods.</p> <ul style="list-style-type: none"> • Perform housekeeping as per prescribed industry standard <p><u>FAULT FINDING AND REPAIRS</u></p> <p>WM-04-WE01 For a period of two weeks, assist an experienced artisan repairing faults on mechanical sub-assemblies and machines</p> <p>WM-04-WE02 Perform repairs on mechanical sub-assemblies and machines</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Observe (WA0101) / perform under supervision (WA0201) / perform (WA0301) inspection processes, safety procedures, lock out, tagging and site preparation procedures • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / perform under supervision (WA0203) / perform (WA0303) a range of mechanical fault-finding, repairs, installation and commissioning tasks (pneumatic system) • WA0104, WA0204, WA0304: The experience must include a variety of breakdowns on pneumatic system
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<p>PM-04-PS09: Replace pneumatic components and assemble pneumatic systems <i>Given a selection of various pneumatic systems and components, relevant tools, pneumatic circuit diagrams, personal protective equipment, specifications and materials,</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA0901 Plan and prepare for replacing components of a pneumatic system and for assembling a pneumatic system • PA0902 Identify potential hazards and risks related to the job and list the appropriate responses • PA0903 Select tools, materials and equipment • PA0904 Replace worn, damaged or defective components and parts • PA0905 Assemble, set and record pneumatic component or part numbers and specifications • PA0906 Conduct post assembly activities • Housekeeping executed according to industry standard <p>PM-08-PS03 Overhaul a mechanical machine that incorporates a hydraulic and pneumatic system <i>Given used machines that incorporates a hydraulic and pneumatic system, worn components, tools, access to everything needed to overhaul the machine, personal protective equipment, specifications</i></p>		<p>WM-04-WE04 Perform repairs on mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts (pneumatic system)</p> <ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods • Perform housekeeping as per industry standards <p>OVERHAULING (pneumatic system)</p> <p>WM-05-WE01: For a period of two weeks, assist an experienced artisan overhauling mechanical sub-assemblies and machines</p> <p>WM-05-WE02: Overhaul a range mechanical machines and sub-assemblies under supervision</p> <p>WM-05-WE03: Overhaul a range mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Observe (WA0101) / perform under supervision (WA0201) / perform (WA0301) overhaul planning processes
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<p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • PA080301 Identify and select specific tools, equipment and materials required for the overhaul process • PA080302 Identify potential hazards and risks related to the job and list the appropriate responses • PA080303 Disassemble the machine and prepare the components for inspection • PA080304 Inspect the components and draw up a material and replacement parts list • PA080305 Replace all worn parts to specification • PA080306 Assemble and restore the machine to conform to the service tolerances specified in the manufacturer specifications • PA080307 Perform post overhauling activities • Perform housekeeping as per industry standards 		<p>and pre-overhauling inspection procedures</p> <ul style="list-style-type: none"> • Observe and assist with (WA0103) / perform under supervision (WA0203) / perform (WA0303) a range of overhauling tasks • WA0103 The experience must include a variety of overhauling projects on breaks and clutches • Perform housekeeping as per industry standards <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications
ASSESSMENT CRITERIA		
<p>PM-03-PS10: Clean and inspect pneumatic systems</p> <ul style="list-style-type: none"> • IAC1001 Procedures to clean and inspect a pneumatic system are explained • IAC1002 A pneumatic system is cleaned and inspected according to procedure • IAC1003 Risks and hazards are identified and responded to in a responsible 	<p>KM-02-KT11: Mechanical working principles, types and applications of pneumatic systems</p> <ul style="list-style-type: none"> • IAC1101 Components and functions of pneumatic systems are identified and described • IAC1102 Units of measurement in pneumatic systems are described 	<p>Supporting Evidence</p> <p><u>ROUTINE MAINTENANCE</u> WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines</p>

<p>manner</p> <ul style="list-style-type: none"> • IAC1004 Leaks, wear, damage, defects and failures on a pneumatic system are identified and explained correctly • IAC1005 Pneumatic system types and Original Equipment Manufacturer specifications are explained <p>PM-05-PS09: Do fault-finding on pneumatic systems</p> <ul style="list-style-type: none"> • IAC0901 Defects or faults on a pneumatic system are identified correctly • IAC0902 Corrective action options are explained correctly • IAC0903 A systematic fault-finding process is followed • IAC0904 Risks and hazards are identified and responded to in a responsible manner <p>PM-06-PS 08: Repair pneumatic systems</p> <ul style="list-style-type: none"> • IAC0801 Instructions and repair specifications are interpreted correctly • IAC0802 Pneumatic system components and specifications are identified correctly • IAC0803 The pneumatic system is disassembled and reassembled correctly • IAC0804 Faulty components are identified and replaced correctly • IAC0805 Sequences to repair the pneumatic system are followed correctly • IAC0806 Tools and equipment are 	<ul style="list-style-type: none"> • IAC1103 Pneumatic symbols and circuits are read and interpreted • IAC1104 Safety precautions pertaining to pneumatic systems are explained <p>KM-02-KT13 Diagnostic techniques</p> <ul style="list-style-type: none"> • Types of diagnostic equipment are identified and described • The various types of diagnostic techniques are described • The sequence involved in a diagnostic procedure or technique is explained • Safety precautions pertaining to diagnostic equipment are explained 	<p>WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision</p> <p>WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p> <p>WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records <p><u>FAULT FINDING AND REPAIRS</u></p> <p>WM-04-WE01 For a period of two weeks, assist an experienced artisan repairing faults on mechanical sub-assemblies and machines</p> <p>WM-04-WE02 Perform repairs on mechanical sub-assemblies and machines</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <p>WM-04-WE04 Perform repairs on mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports
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<p>identified and used correctly</p> <ul style="list-style-type: none"> • IAC0807 Post repair or overhaul activities are performed correctly • IAC0808 Safety requirements are met <p>PM-04-PS09: Replace pneumatic components and assemble pneumatic systems</p> <ul style="list-style-type: none"> • IAC0901 Procedures to replace pneumatic system components and assemble a pneumatic system are explained • IAC0902 Pneumatic components are replaced according to procedures and specifications • IAC0903 A pneumatic system is assembled according to procedures and Original Equipment Manufacturer specifications • IAC0904 Risks and hazards are identified and responded to in a responsible manner <p>PM-08-PS03 Overhaul a mechanical machine that incorporates a hydraulic and pneumatic system</p> <ul style="list-style-type: none"> • Safety requirements are met • Overhauling specifications and quality requirements are explained accurately • Tools, equipment, materials and parts are identified and described correctly • The sequence of activities to overhaul the machine is adhered to 		<ul style="list-style-type: none"> • Workplace logbook or portfolio • Equipment downtime records <p><u>OVERHAULING</u></p> <p>WM-05-WE01: For a period of two weeks, assist an experienced artisan overhauling mechanical sub-assemblies and machines</p> <p>WM-05-WE02: Overhaul a range mechanical machines and sub-assemblies under supervision</p> <p>WM-05-WE03: Overhaul a range mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio
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<ul style="list-style-type: none"> • The final product meets service tolerances specified in the manufacturer specifications 		
<p>Internal Assessment to be performed:</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 15 questions (30 min) and the competency will be at 80% • Practical exercise of 45min length covering all associated tasks and procedures. <ul style="list-style-type: none"> ○ No injury or unsafe act had occurred ○ Interpret symbols and abbreviations. ○ Interpret elementary Pneumatic circuit diagrams ○ Identify compressed air pipelines ○ Maintain air service units ○ Maintain directional control, flow control and pressure valves ○ Complete the symbol test according ○ Set service unit pressure ○ Install and maintain Pneumatic tubing and fittings. ○ Install and maintain flexible hoses and fittings ○ Install and maintain air service units. ○ Install and maintain cylinders. ○ Install and maintain directional control, flow control and pressure valves. ○ Testing of set safety valves. ○ Recall the service procedure for air receivers ○ Diagnose faults in pneumatic systems. ○ Complete the symbol test ○ Set service unit pressure ○ All safety aspects adhered to according company policies ○ No damage to equipment <p>Learning resources for teaching</p> <ul style="list-style-type: none"> • Learning material on defined Knowledge and Practical Skills Modules • Samples (and charts) of Pneumatic Valves and power packs • Safe Operating Procedure and Safe Working Procedure 		

- Charts of risk assessment procedure and safety measures
- Videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles
- Spanners set
- Allen key set
- Screw driver
- Pipe wrench
- Pipe cutter
- Hacksaw
- Valves and fittings
- Tape measure
- Smooth half round file
- Basic pneumatic simulation station with different valves, cylinders and pipes
- Additional pneumatic valves, Cylinders and pipes

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>M3</h1>
		Curriculum code: 653303000		
Learning area title: Perform work activities on pneumatic systems	Total hours	SDP	WP	
		208	160	
Work situation title: Perform installation and commissioning activities on pneumatic systems	Total hours	24	24	
Work scenario: Mandla has to install a new pneumatic system for the door on the furnace. He first starts with the new installation for the pneumatic pipeline according to the diagram given. After this he installs the valves and the cylinders. The Electricians connect the new system to their PLC room. Mandla can now test the system and ensures that it works according to the diagram given and according to the correct sequencing.				
Prerequisite learning: M2				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
PM-07-PS08 Install pneumatic system components and commission pneumatic systems <i>Given practical assignments, a repaired pneumatic system component, tools, personal protective equipment, specifications:</i> The apprentice must be able to: <ul style="list-style-type: none"> • PA0801 Read and interpret the installation and commissioning specifications and quality requirements • PA0802 Identify and select specific tools, equipment and materials required for the installation and commissioning process • PA0803 Plan the sequences for installation and commissioning • PA0804 Identify potential hazards and risks related to the job and list the appropriate responses 	Knowledge of: KM-02-KT11 Mechanical working principles, types and applications of pneumatic systems <ul style="list-style-type: none"> • KT1101 Pneumatic systems • KT1102 Units of measurement in pneumatic systems (pressure, flow rate, area) • KT1103 Pneumatic symbols and circuits • Valve components • The functions and use of valves • Cylinder components • Static and non-static seals • FLR knowledge <u>Applied Knowledge</u> PM-07-PS08 Install pneumatic system components and commission pneumatic systems <ul style="list-style-type: none"> • AK0801 Installation of pneumatic system components 		The apprentice will be expected to gain The practical experience (engage) in the following work activities: WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously [Focus: Install and commission] <ul style="list-style-type: none"> • WA0301 Perform inspection processes safety procedures, lock out, tagging and site preparation procedures • WA0302 Interact with production personnel and report • WA0303 Perform installation and commissioning tasks for pneumatic systems <ul style="list-style-type: none"> ○ Gather necessary technical information, develop installation and commissioning plan, list and obtain required parts & materials ○ Install as per manufacturers' and workplace specifications 	

<ul style="list-style-type: none"> • PA0805 Prepare the work area for installation of the pneumatic system • PA0806 Install the pneumatic system to specifications • PA0807 Use tools and equipment correctly • PA0808 Follow the correct installation procedures and sequence • PA0809 Check the pneumatic system installation by performing a systematic inspection of all the critical control points • PA0810 Commission the pneumatic system by performing a final inspection and performance test • PA0811 Perform post installation and commissioning activities • Risk-assessment should be in place when working on test bench • Safe operating procedures to be followed correctly • Test for zero energy/potential test correctly • Perform housekeeping as per industry standards 	<ul style="list-style-type: none"> • AK0802 Operation of pneumatic system • AK0803 Commissioning of pneumatic system • AK0804 Use of and care for tools and equipment 	<ul style="list-style-type: none"> ○ Conduct post-installation inspection and functionality tests and commission the installations ○ Complete all relevant documentation • Perform Housekeeping as per industry standards <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling & storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications
ASSESSMENT CRITERIA		
<p>PM-07-PS08 Install pneumatic system components and commission pneumatic systems</p> <ul style="list-style-type: none"> • Pneumatic system components are correctly installed in terms of procedure, sequence and specifications 	<p>KM-02-KT11 Mechanical working principles, types and applications of pneumatic systems</p> <ul style="list-style-type: none"> • Components and functions of pneumatic systems are identified and described • Units of measurement in pneumatic systems are described 	<p>Supporting Evidence</p> <p>WM-04-WE03 Perform repairs on mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • SE0301 Signed-off job cards • SE0302 Non-conformance reports

<ul style="list-style-type: none"> • Pneumatic system operation is checked and adjusted if necessary • Pneumatic system is commissioned as per procedure • Quality requirements are met • Safety requirements are met • Job observation to be performed before working on test bench 	<ul style="list-style-type: none"> • Pneumatic symbols and circuits are read and interpreted • Safety precautions pertaining to pneumatic systems are explained 	<ul style="list-style-type: none"> • SE0303 Workplace logbook or portfolio • SE0304 Equipment downtime records • Installation documentation
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Internal Assessment to be performed

- Internal knowledge test of a minimum of 20 questions and the competency will be at 80%
- Practical exercise of 45min length
 - No injury or unsafe act had occurred
 - No Injuries to self/co-worker and the environment or damage to equipment
 - Interpret symbols and abbreviations.
 - Interpret pneumatic circuit diagrams.
 - Identify compressed air pipelines.
 - Install and maintain compressed air pipelines.
 - Install and maintain air service units.
 - Install and maintain cylinders.
 - Install and maintain directional control, flow control and pressure valves.
 - Testing of set safety valves.(Standard pressure set at 6 Bar)
 - Recall the service procedure for air receivers.
 - Diagnose faults in pneumatic systems.
 - Complete the symbol test according
 - Set service unit pressure
 - Construct the circuit shown on pneumatic diagram
 - The circuit must operate in sequence
 - The assessor will ensure that you have all the necessary material and equipment to perform the task.
 - You must stop working immediately as soon as the allocated time for the task has expired.
 - Service unit pressure must be adjusted to specified pressure.
 - There must be no damage to the equipment.
 - All safety aspects adhered to according company policies

- No injury or damage to equipment

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of Pneumatic Diagrams, pneumatic valves and cylinders
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- CDs and videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles
- Intermediate Pneumatic Simulation station with different valves, Cylinders and pipes
- Additional Pneumatic valves, Cylinders and pipes

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>M4</h1>
		Curriculum code: 653303000		
Learning area title: Perform work activities on pneumatic systems	Total hours	SDP	WP	
		208	160	
Work situation title: Perform basic activities on electro pneumatic systems (ELECTIVE)	Total hours	80	40	
Work scenario: Mary has to work on an electro-pneumatic system in the plant. She has to be able to read and interpret the diagram and follow the flow. Mary has to work with an electrician regarding the electrical current.				
Prerequisite learning: M1-M3				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>QCTO none</p> <p><i>Given electro-pneumatic system specifications or samples, diagrams, materials and hand tools:</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Explain the operation of a electro pneumatic system is explained by identifying and describing the functions of its main components. • Check valves, junction elements (AND Valve and OR Valve). • The categories include manual, mechanical, pressure and basic electricity. • Define and explain control by pneumatic control elements is explained using examples. • Control elements include flow control valves, pressure regulating valves, pressure limiting valves, safety valves, sequencing valves and time delay valves. 	<p>Knowledge of:</p> <p>KM-02-KT11 Mechanical working principles, types and applications of pneumatic systems</p> <ul style="list-style-type: none"> • KT1101 Pneumatic systems • KT1102 Units of measurement in pneumatic systems (pressure, flow rate, area) • KT1103 Pneumatic symbols and circuits • Discuss the principles of pneumatics. • The concept of pneumatics is explained in terms of its history and modern usage. • The compressor is discussed in terms of how it works and its function in the air supply system in a factory. • Types include screw type compressor, sliding vane compressor, roots compressor and turbo/turbine-compressors • The air service unit is described in terms of it various parts. 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <ul style="list-style-type: none"> • Assist a competent person in working on an electro pneumatic system • Perform housekeeping as per industry standards 	

<ul style="list-style-type: none"> • Explain final control by pneumatic actuators based on examples • Actuators include linear actuators, rotary actuators and compressed air motors. • Calculate Pneumatic related quantities • Discuss the principles of electro Pneumatics. 	<ul style="list-style-type: none"> • Symbols include filters, dryers, storage, gauges and sensors. • The distribution and connectivity of air supply is discussed in relation to the various stages and challenges involved. • Symbols used in pneumatics are identified and the functions of the components that they represent are discussed. • Explain the use of pneumatic components. • Sensors are discussed as input elements and the different types of sensors are described. • Sensors include proximity sensor, photoelectric sensor and limit switch. • The use of directional and non-return control valves is discussed with examples. • Directional valves are discussed in term of their symbols and lettering. • Valve actuation is discussed in relation to the various categories. • The term Pneumatics is defined in terms of related concepts. • Pneumatic fluids are discussed in terms of their purpose and physical characteristics. • Various related Pneumatic quantities are determined by calculation. 	
ASSESSMENT CRITERIA		
<ul style="list-style-type: none"> • Pneumatic related element symbols and circuit layout are explained in terms of the components they represent. • Pneumatic control and function diagrams are developed for various applications. 	<p>KM-02-KT11 Mechanical working principles, types and applications of pneumatic systems</p> <ul style="list-style-type: none"> • Components and functions of pneumatic systems are identified and described 	<p>Supporting Evidence</p> <ul style="list-style-type: none"> • None required

<ul style="list-style-type: none"> • The construction and purpose of the related Pneumatic accessories are discussed in terms of their functions. • Various Pneumatic circuit applications are connected and tested according to procedure. 	<ul style="list-style-type: none"> • Units of measurement in pneumatic systems are described • Pneumatic symbols and circuits are read and interpreted • Safety precautions pertaining to pneumatic systems are explained 	
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Internal Assessment to be performed

- Internal knowledge test of a minimum of 30 questions (60min) and the competency will be at 80%
- Practical exercise of 1H30 length
 - No injury or unsafe act had occurred
 - No Injuries to self/co-worker and the environment or damage to equipment
 - Interpret symbols and abbreviations.
 - Interpret pneumatic circuit diagrams.
 - Identify compressed air pipelines.
 - Install and maintain compressed air pipelines.
 - Install and maintain air service units.
 - Install and maintain cylinders.
 - Install and maintain directional control, flow control and pressure valves.
 - Testing of set safety valves.
 - Recall the service procedure for air receivers.
 - Diagnose faults in pneumatic systems.
 - Complete the symbol test according to ISO 1219.
 - Set service unit pressure
 - Construct the circuit shown on pneumatic diagram
 - The circuit must operate in sequence
 - Detect the fault introduced by the assessor after he has checked the circuit.
 - The assessor will ensure that you have all the necessary material and equipment to perform the task.
 - You must stop working immediately as soon as the allocated time for the task has expired.
 - Service unit pressure must be adjusted to specified pressure.
 - The fault introduced by the assessor must be correctly identified and recorded.
 - There must be no damage to the equipment.
 - All safety aspects adhered to according company policies

- No injury or damage to equipment

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of Pneumatic Diagrams, pneumatic valves and cylinders
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- CDs and videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles
- Basic Electro-Pneumatic Simulation station with different valves, Cylinders and pipes
- Additional Pneumatic valves, Cylinders and pipes

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		N1
		Curriculum code: 653303000		
Learning area title: Inspect, maintain and fault find on conveyor systems	Total hours	SDP	WP	
		72	96	
Work situation title: Inspect, maintain conveyor systems (incl. rolling elements, structure and belts) and Inspect safety guards and shout	Total hours	40	48	
Work scenario: Adrian is responsible for inspecting the 3km conveyer belt in the mornings. She will need to locate, inspect and maintain all the components to the prescribed standard. Safety is premium, therefore isolation and lockout must be completed correctly before components are replaced according to OEM specifications.				
Prerequisite learning: Year 2				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>QCTO none</p> <p><i>Given a conveyor system (incl. rolling elements, structure and belts), which requires routine maintenance:</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • Inspect, maintain conveyor systems (incl. rolling elements, structure and belts) • Replace rolling components on different types of conveyors • Fault find on conveyor systems • Inspect safety installations on conveyor systems • Remove and replace conveyor belts (Elective) 	<p>Knowledge of:</p> <p>KM-02-KT12 Types and functions of conveyors</p> <ul style="list-style-type: none"> • KT1201 Conveyors • KT1202 Functions of conveyors <ul style="list-style-type: none"> • The application of conveyor systems • Basic principles of operation • Classifications and types • The applications and the distinct features and characteristics of various types of conveyor systems are explained • The terminology used when explaining and discussing conveyor systems, in keeping with manufacturer and worksite norms and standards. • Basic lifting equipment 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p><u>ROUTINE MAINTENANCE</u></p> <p>WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines</p> <p>WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision</p> <p>WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Observe (WA0101) / conduct under supervision (WA0201) / conduct 	

Given conveyor systems and work instructions:

The apprentice must be able to:

- The classifications and types of conveyor systems are identified and discussed.
- The conveyor system/s are inspected and assessed for its work requirements in terms of maintenance, repair and/or removal
- The planning and preparation for the maintenance repair and/or removal of the conveyor system/s is explained, in accordance with work instructions
- Site and equipment are prepared for conveyor system maintenance
- Where required, handling space is cleared, potential obstructions are removed and personnel are notified, prior to the maintenance, repair and/or removal task.
- Respond to `what if` and `why` questions covering:
 - The maintenance process - sequence, procedures and techniques.
 - Tools and equipment used.
 - Quality awareness: implications of conveyor system maintenance that do not comply with operational requirements.
- Applicable conveyor system maintenance theory.
- Reporting and documentation

(WA0301) inspection processes, safety procedures, lock out, tagging and site preparation procedures during routine maintenance

- Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting
- Observe and assist with (WA0103) / conduct under supervision (WA0203) / conduct (WA0303) a range of routine maintenance tasks of varying complexity (**conveyor systems**)
- WA0104, WA0204, WA0304: The experience must include routine maintenance **conveyor systems**

WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts (conveyor systems**)**

- WA0401 Perform tasks within accepted standards of performance under work pressure
- WA0402 Perform a range of routine maintenance tasks under work pressure
- WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods.

<p>requirements</p> <ul style="list-style-type: none"> • Maintain conveyor system. • Maintenance includes identifying non-conforming components, removal, repair and installation of components and parts and confirming functionality. • Conveyor system is maintained in compliance with operational requirements. • The conveyor system is tested for conformance within operational requirements and according to manufacturer's specifications. • Operational requirements include correct function of the drive, braking unit and conveyor load carrying medium (bucket, screw). • Checks include the evaluation and adjustment of tolerances where required. • Checking for compliance may include commissioning procedures. • Work area is restored to a safe and serviceable condition. • All work is performed safely with due care for self, fellow workers, machines, equipment, materials and environment. • Conveyor system condition is recorded and reported. • System is confirmed to be isolated. • Conveyor system is inspected and non-conformances identified. • Conveyor system maintenance requirements are determined 		<ul style="list-style-type: none"> • Perform housekeeping as per prescribed industry standard <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications
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<ul style="list-style-type: none"> • Consumables, parts and/or components are selected, fitted and adjusted to meet operational requirements. • The conveyor system is checked for conformance with manufacturer specifications and safety standards. • Non-conforming or damaged components and equipment are identified and appropriate corrective action taken. • Conveyor system records are completed and processed. • Work is carried out in a safe manner in accordance with schedules and manufacturer specifications. • Maintenance process cycle time meets workplace requirements. • Applicable health, safety and environmental procedures are adhered to • Proper Housekeeping 		
ASSESSMENT CRITERIA		
<ul style="list-style-type: none"> • Hazards and risks are identified and responded to in a responsible manner & in accordance with accepted hazard identification and risk assessment practices • Correct installation and handling of rolling elements are described and explained • Fault-finding is explained to cover most common deviations 	<p>KM-02-KT12 Types and functions of conveyors</p> <ul style="list-style-type: none"> • Types of conveyors are identified and described • Functions of different types of conveyors are explained • Safety precautions pertaining to conveyors are explained • Describe the effect of adverse conditions (cleanliness and spillage) on the 	<p>Supporting Evidence</p> <p><u>ROUTINE MAINTENANCE</u> WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines WM-02-WE02 Perform routine maintenance of a range mechanical</p>

<ul style="list-style-type: none"> • Method of replacing conveyor belt correctly applied (when required) • Conveyor system records are completed and processed • Work is carried out in a safe manner in accordance with schedules and manufacturer specifications. • Maintenance process cycle time meets workplace requirements. • A clean and tidy work environment is maintained • No delays are caused as a result of poor planning for conveyor system maintenance and identifying problems. • Applicable health, safety and environmental procedures are adhered to • Tools, equipment, lifting equipment and tackle is stored in accordance with manufacturer's specification and requirements. • Malfunctioning tools and equipment is reported and the necessary arrangements for the repair thereof is made according to accepted worksite practice. • Non-conforming or damaged tools and equipment are identified and appropriate corrective action taken. • The proper care and storage procedures of tools and equipment are explained in accordance with work site practices and specifications. 	<p>operational characteristics of a conveyor belt</p>	<p>machines and sub-assemblies under supervision WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records
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| <ul style="list-style-type: none">• Work area is restored to a safe and serviceable condition. | | |
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Internal Assessment to be performed

- Internal knowledge test of a minimum of 50 marks (60min) and the competency will be at 80%
- Practical exercise of 90min Standard time covering all the above-mentioned items
 - No injury or unsafe act had occurred
 - No Injuries to self/co-worker and the environment or damage to equipment
 - Inspection of the conveyer carried out correctly and all evidence recorded correctly
 - Components replaced as per requirements
 - All bolts tightened according to specification
 - Adjustment bolts loose after tension is set
 - Faults correctly identified and corrected
 - All safety guards are in place and secured
 - All safety aspects adhered to according company policies
 - Level of competency of 100% (critical) required for:
 - Safety and hazards
 - Level of competency of 80% required for:
 - Types of conveyors
 - Replacing of components
 - Fault-finding and repair

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of different rollers, different conveyer systems
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- CDs and videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment; Overalls; Safety Boots; Safety Goggles
- Functional conveyor belt
- Set of spanners
- Screwdrivers
- Coffin hoist and lifting tackle
- Crowbar
- Lockout mechanism
- Belt knife
- Combination pliers
- Hammer
- Spade and scraper
- Infra-red/Heat gauge
- Splicing equipment and associated tools
- Conveyer simulation with additional belts and rollers
- Safety guards on the conveyer simulator, Lifting equipment

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>N2</h1>
		Curriculum code: 653303000		
Learning area title: Inspect, maintain and fault find on conveyor systems	Total hours	SDP	WP	
		72	96	
Work situation title: Track conveyor belts	Total hours	8	16	
Work scenario: Lefa has to ensure that conveyer M3 is running correctly. On investigations he found that the conveyer is not running in the centre of the drive roller and the tension is too slack. Lefa has to tract the conveyer belt so that it runs in the centre and that the tension is correct. He adjusts and tests it when it is running. Once the conveyer belt is tracked and the tension is correct, he ensures that the bolts on the base are fully tightened. Safety is premium therefore isolation and lockout must be completed correctly components must be replaced according to OEM specifications.				
Prerequisite learning: N1				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>QCTO none</p> <p><i>Given a conveyor system (incl. rolling elements, structure and belts), which requires tracking</i></p> <p>The apprentice must be able to:</p> <p>Track the conveyor belt</p> <ul style="list-style-type: none"> • Pulleys and tracking • Explain Common belt conveyor problems • Identify probable causes and solutions • Determine sequence of tracking operations <p>Rolling movement, the belt</p> <ul style="list-style-type: none"> • Observe run out without load • Perform tracking correction - starts at drive pulley and works down return towards tail pulley 	<p>QCTO none</p> <p>Knowledge of:</p> <p>Idlers and Frames</p> <ul style="list-style-type: none"> • Design of idlers and frames • Troughing carrying idlers • Return idlers • Idler spacing • Conveyor frames <p>Pulleys and counterweights</p> <ul style="list-style-type: none"> • Conveyor take-ups • Pulley design and lagging • Counterweights <p>Loading</p> <ul style="list-style-type: none"> • Loading Chutes • Arrangement of Impact Belt at Loading Point 		<p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <p><u>ROUTINE MAINTENANCE</u></p> <p>WM-02-WE01 For a period of two weeks, assist an experienced artisan performing routine maintenance on mechanical sub-assemblies and machines</p> <p>WM-02-WE02 Perform routine maintenance of a range mechanical machines and sub-assemblies under supervision</p> <p>WM-02-WE03 Perform routine maintenance of a range mechanical machines and sub-assemblies autonomously</p> <ul style="list-style-type: none"> • Observe (WA0101) / conduct under supervision (WA0201) / conduct 	

<ul style="list-style-type: none"> • Centre belt on the tail pulley by manipulation of return idlers and with the assistance of self-aligning return rolls • Ensure empty belt troughs well • Adjust snub pulley as a supplementary tracking means • Perform Troughing side alignment with and without load • Place self-aligning idlers • Perform housekeeping as per industry standards 	<ul style="list-style-type: none"> • Loading on an Incline • Skirt boards 	<p>(WA0301) inspection processes, safety procedures, lock out, tagging and site preparation procedures during routine maintenance</p> <ul style="list-style-type: none"> • Observe interaction (WA0102) / conduct interaction under supervision (WA0202) / interact (WA0302) (WA0402) with production personnel and reporting • Observe and assist with (WA0103) / conduct under supervision (WA0203) / conduct (WA0303) a range of routine maintenance tasks of varying complexity (conveyor systems) • WA0104, WA0204, WA0304: The experience must include routine maintenance conveyor systems <p>WM-02-WE04: Perform routine maintenance of mechanical machines and sub-assemblies autonomously under work pressure conditions such as shifts (conveyor systems)</p> <ul style="list-style-type: none"> • WA0401 Perform tasks within accepted standards of performance under work pressure • WA0402 Perform a range of routine maintenance tasks under work pressure • WA0403 The experience must include a variety of pressure situations caused by factors such as limited availability of technical support during shifts, high work volumes, peak production periods.
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		<ul style="list-style-type: none"> • Perform housekeeping as per prescribed industry standard <p><u>Contextualised Workplace Knowledge</u></p> <ul style="list-style-type: none"> • Workplace Hazard Inspection and Risk Assessment procedures • Material request & storage procedures • Equipment handling and storage procedures • Standard operating procedures • Reporting channels and delegated responsibilities • Work records • Original Equipment Manufacturer manuals and specifications
ASSESSMENT CRITERIA		
<ul style="list-style-type: none"> • Hazards and risks are identified and responded to in a responsible manner & in accordance with accepted hazard identification and risk assessment practices • Correct installation and handling of rolling elements are described and explained • Method of tracking conveyor belts are explained • Fault-finding is explained to cover most common deviations 	<p>Idlers and Frames</p> <ul style="list-style-type: none"> • Design of idlers and frames are discussed • Installation of all types of idlers are explained • Idler spacing is discussed • Conveyor frames and the adjustment thereof is discussed <p>Pulleys and counterweights</p> <ul style="list-style-type: none"> • The operation of Conveyor take-ups and counterweights are discussed • Pulley design and lagging are explained <p>Loading</p> <ul style="list-style-type: none"> • Loading chutes are discussed • Impact Belt at Loading Point are 	<p>Supporting Evidence</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records

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| | <p>discussed</p> <ul style="list-style-type: none">• Loading on an incline is explained• Reasons for Skirt boards are explained | |
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Internal Assessment to be performed

- Internal knowledge test of a minimum of 20 marks (30min) and the competency will be at 80%
- Practical exercise of 20 min standard time covering all the above-mentioned items
 - No injury or unsafe act had occurred
 - No Injuries to self/co-worker and the environment or damage to equipment
 - Inspection of the conveyer carried out correctly and all evidence recorded correctly
 - Components replaced correctly
 - The conveyer tracked correctly
 - All bolts tighten according to specification
 - Adjustment bolts loose
 - Faults correctly identified and recorded according to industry practice
 - All safety guards are in place and secured
 - Level of competency of 100% (critical) required for:
 - Safety and hazards
 - Level of competency of 80% required for:
 - Types of conveyors
 - Replacing of components
 - Fault-finding and repair

Learning resources for teaching

- Learning material covering Knowledge and Practical Skills Modules
- Samples (and charts) of different rollers, different conveyer systems
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- CDs and videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment; Overalls; Safety Boots;

- Functional conveyor belt
- Set of spanners
- Screwdrivers
- Coffin hoist and lifting tackle
- Crowbar
- Lockout mechanism
- Belt knife
- Combination pliers
- Hammer
- Spade and scraper
- Conveyer simulation with additional belts and rollers
- Safety guards on the conveyer simulator

Occupation/trade title: Mechanical Fitter		SAQA ID: 94021		<h1>N3</h1>
		Curriculum code: 653303000		
Learning area title: Inspect, maintain and fault find on conveyor systems	Total hours	SDP	WP	
		72	96	
Work situation title: Remove and replace conveyor belts / splicing (excluding vulcanization (vusing) (ELECTIVE)	Total hours	24	32	
Work scenario: Mario is tasked with replacing the conveyor belt M6. He first starts with his risk assessment and isolation. After which he cleans the area and cuts the old conveyor and removes it. He then ensures all rollers are in good condition, before he puts in the new conveyor in. After the new conveyor is inserted he then starts joining the two ends with a mechanical splicing. When the splicing is completed Mario can start with the re-tensioning of the belt and the tracking of the conveyor belt.				
Prerequisite learning: N2				
INTEGRATED LEARNING CONTENT				
Practical skills modules (PM)	Knowledge modules (KM)		Work experience modules (WM)	
<p>QCTO none</p> <p><i>Given conveyor simulation with additional belts and rollers, equipment for splicing, lifting equipment and Safety guards on the conveyor simulator</i></p> <p>The apprentice must be able to:</p> <ul style="list-style-type: none"> • The classifications and types of conveyor systems are identified and discussed. • Procedures include removal, replacement, routine servicing, strip and assembly, overhauling, fault finding. • The planning and preparation for the maintenance, repair and/or removal of the conveyor system/s is explained, in accordance with work instructions. • Site and equipment are prepared for conveyor system maintenance. 	<p>QCTO none</p> <p>Knowledge of:</p> <ul style="list-style-type: none"> • Identification of the equipment to be maintained, obtaining maintenance schedules and manufacturer specifications for specific equipment to be maintained. • Different types of splicing for different kind of belt and the use • Correct Tools required for splicing • Basic knowledge of correct lifting equipment to be used 		<p>The apprentice will be expected to gain QCTO none</p> <p>The apprentice will be expected to gain practical experience (engage) in the following work activities:</p> <ul style="list-style-type: none"> • Plan and prepare for the maintenance, repair and/or removal of the conveyor system/s in accordance with work instructions • Perform removal and replacement of conveyor system/s • Perform routine servicing of conveyor system/s • Perform stripping and assembly, overhauling and fault finding of conveyor system/s • Perform housekeeping as per prescribed industry standard 	

<ul style="list-style-type: none">• Where required, handling space is cleared, potential obstructions are removed and personnel are notified, prior to the maintenance, repair and/or removal task.• Quality awareness: implications of conveyor system maintenance that do not comply with operational requirements.• The conveyor system is tested for conformance within operational requirements and according to manufacturer's specifications.• Operational requirements include correct function of the drive, braking unit and conveyor load carrying medium (bucket, screw).• Safe and serviceable condition.• All work is performed safely with due care for self, fellow workers, machines, equipment, materials and environment.• System is confirmed to be isolated.• Mechanical splices are formed by using special components manufactured from steel.• There are two basic types, namely "Hinged and Fixed plate"• The hinged systems consist of two interlocking halves, which are connected and hinge around a central connecting shaft.• Perform Housekeeping as per industry standards• Performance assessment report for completion of work situation		
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ASSESSMENT CRITERIA		
<ul style="list-style-type: none"> • Splicing procedures followed correctly • Conveyor system records are completed and processed • Work is carried out in a safe manner in accordance with schedules and manufacturer specifications. • A clean and tidy work environment is maintained. • Malfunctioning tools and equipment is reported and the necessary arrangements for the repair thereof is made according to accepted worksite practice. • Work area is restored to a safe and serviceable condition. 	<ul style="list-style-type: none"> • Types of conveyors are identified and described • Functions of different types of conveyors are explained • Safety precautions pertaining to conveyors are explained • Correct splicing methods to be used 	<p>Supporting Evidence</p> <ul style="list-style-type: none"> • Signed-off job cards • Non-conformance reports • Workplace logbook or portfolio • Equipment downtime records
<p>Internal Assessment to be performed</p> <ul style="list-style-type: none"> • Internal knowledge test of a minimum of 10 questions (20min) and the competency will be at 80% • Practical exercise of 1H30 length covering <ul style="list-style-type: none"> ○ No injury or unsafe act had occurred ○ No Injuries to self/co-worker and the environment or damage to equipment ○ Inspection of the conveyer carried out correctly and all evidence recorded correctly ○ Components replaced correctly ○ The conveyer tracked correctly ○ Splicing done correctly ○ All bolts tightened according to specification ○ Adjustment bolts loose ○ Commissioning of the conveyer system ○ Correct lockout procedure followed ○ Faults correctly identified and corrected ○ All safety guards are in place and secured 		

- All safety aspects adhered to according company policies
- No injury or damage to equipment

Learning resources for teaching

- Learning material on defined Knowledge and Practical Skills Modules
- Samples (and charts) of different rollers, different splicing technics, different conveyer systems
- Safe Operating Procedure and Safe Working Procedure
- Charts of risk assessment procedure and safety measures
- CDs and videos will be an added advantage

Tools, Equipment and Materials

- Personal Protective Equipment: Overalls; Safety Boots; Safety Goggles
- Conveyer simulation with additional belts and rollers
- Equipment for splicing, lifting equipment
- Safety guards on the conveyer simulator

Mechanical Fitter Tools and Equipment List

NOCC-A21 TOOLS AND EQUIPMENT LIST		
TRADE: Mechanical Fitter		
TOOLBOX ITEMS		
NO	ITEM DESCRIPTION	RATIO (for 30 learners)
1	Allen key set - Imperial	01:01
2	Allen key set - Metric	01:01
3	Ballpein hammer 300g	01:01
4	Bustard file	01:01
5	Centre punch	01:01
6	Cold chisel	01:01
7	Dowel punch set	01:01
8	External circlip pliers	01:01
9	Feeler gauge	01:01
10	File brush	01:01
11	Hack saw	01:01
12	Internal circlip pliers	01:01
13	Knife – retractable blade (Stenley)	01:01
14	Longnose pliers	01:01
15	Mallet	01:01
16	Padlock and key	01:01
17	Paint brush	01:01
18	Pliers combination insulated 200mm	01:01
19	Prick punch	01:01
20	Protractor	01:01
21	Scriber	01:01
22	Scriber	01:01
23	Second cut file	01:01
24	Set files (Bastard; second cut & Smooth)	01:01
25	Set of screw drivers	01:01
26	Set pin punches – parallel	01:01
27	Set socket and spanners	01:01
28	Side cutter pliers	01:01
29	Smooth file	01:01
30	Spanner set 6 – 36mm	01:01
31	Tinsnips 300mm	01:01
32	Tool box	01:01
33	Vice grip	01:01
34	Waterpump pliers	01:01
35	Wrench adjustable 150mm	01:01
36	Wrench adjustable 300mm	01:01

WORKSHOP TOOLS		
NO	ITEM DESCRIPTION	RATIO (for 30 learners)
37	Bearing puller(optional)	01:12
38	Combination set square	01:01
39	Copper hammer	01:03
40	C-Spanner	01:12
41	Magnifying glass X 4(optional)	01:06
42	Marking off table	01:12
43	Oil can	01:04
44	Tap sets	01:05
45	Different wheel dresser	01:08
46	Hydraulic press hand operated	01:01
47	Screw Extracter Set	01:05
48	Rubber mat	01:01
49	Lubrication systems and components	01:10
50	Bench vice	01:01
51	Marking off table or surface plate with angle plate	01:10
52	Work bench with vice	01:01
SPECIAL TOOLS		
NO	ITEM DESCRIPTION	RATIO (for 30 learners)
53	Bearing heater	01:12
54	CAD software	01:02
55	Computer system	01:02
56	Computers	01:02
57	Drill chuck with arbor	01:04
58	Drill drift	01:06
59	Printers	01:15
60	Sleeves (various sizes)	01:03
61	Taper key hub and bush	01:04
62	Torque wrench	01:02
63	V- block	01:05
64	Viscosity tester	01:30
65	Wheel balancing apparatus	01:15
MEASURING EQUIPMENT		
NO	ITEM DESCRIPTION	RATIO (for 30 learners)
66	Caliper inside	01:01
67	Caliper outside	01:01
68	Depth micrometer	01:04
69	Dial test indicators with magnetic base	01:02
70	Engineering square	01:01
71	Feeler gauge	01:01
72	Inside micrometer set 0 – 300mm	01:03

73	Jenny caliper (optional)	01:06
74	Machine level	01:15
75	Measuring tape 3 m	01:01
76	Micrometer: 0-25mm/ 25-50mm	01:01
77	Micrometer: 50-75/75-100mm	01:01
78	Pulley gauge	01:06
79	Radius gauge range 2 -13mm	01:01
80	Slip gauge set	01:04
81	Spirit level	01:01
82	Spring divider	01:01
83	Steel rule 0 – 150mm	01:01
84	Steel rule 0 – 300mm	01:01
85	Straight edge	01:03
86	Telescoping gauge set 12 – 54	01:12
87	Tensioner gauge	01:01
88	Thread pitch gauge	01:01
89	Thread tool gauge	01:01
90	Vernier caliper 150mm	01:01
91	Vernier height gauge	01:05

MACHINERY

NO	ITEM DESCRIPTION	RATIO (for 30 learners)
92	Big Hand grinder with deadman switch	01:04
93	Drill press	01:06
94	Grinding wheel charts	01:10
95	Hand grinder 115mm with deadman switch	01:05
96	Jigsaw	01:05
97	Pedestal drilling machine	01:06
98	Pedestal grinder	01:06
99	Band Saw	01:30

MACHINERY TOOLS

NO	ITEM DESCRIPTION	RATIO (for 30 learners)
100	Taper sleeve MT1	01:10
101	Taper sleeve MT2	01:10
102	Taper sleeve MT3	01:10
103	Screw jacks set	01:01
104	Speed and feed charts	01:10
105	Parallel set	01:10
106	Machine vice	01:10
107	Material charts	01:10
108	Angle plate	01:06
109	Bench vice	01:01
110	Clamp set	01:04

111	Deadblow mallet	01:02
112	Drill and tap chart	01:15
113	Face plate	01:08
114	Presision vice	01:15
MACHINERY CONSUMABLES		
NO	ITEM DESCRIPTION	RATIO (for 30 learners)
115	Paint brush	01:01
116	Drill chuck	01:04
EQUIPMENT (LONG TERM CONSUMABLES)		
NO	ITEM DESCRIPTION	RATIO (for 30 learners)
117	Drill set 1-13	01:01
118	Bearing handbook	01:05
119	Gland bushes	01:04
120	Grease gun	01:03
121	Mechanical seals	01:08
122	Zeas Book	
ASSEMBLIES		
NO	ITEM DESCRIPTION	RATIO (for 30 learners)
123	Gearboxes double reduction	01:15
124	Bearing grease types/plumberblocks	01:05
125	Bronze, white metal, synthetic and split bearings	01:10
126	Conveyor simulation with additional belts and rollers	01:15
127	Deep groove, angular contact, self alignment and thrust ball bearings	01:10
128	Disc brake system	01:15
129	Electro magnetic brake system	01:15
130	Fits and tolerances chart	01:10
131	Flanges	variety
132	Gear boxes	01:06
133	GIB head, parallel, taper, feather, woodruff keys	01:15
134	Lock plates	
135	Multi disc clutch system	01:15
136	Safety guards on the conveyor simulator	01:10
137	Safety guards on the conveyor simulator, lifting equipment	01:10
138	Seating table for gate valves	01:10
139	Sperical, thrust, taper and cylindrical roller bearings	01:10
140	Spherical bearing with puller	01:10
141	Thruster brake with drum	01:10
142	Workbench with key fitting apparatus	01:06
143	Worm wheel type reduction gearbox	01:06

144	Different clutch systems	01:01
DRIVES		
NO	ITEM DESCRIPTION	RATIO (for 30 learners)
145	Aligning apparatus with couplings	01:08
146	Dial Test Indicator Alignment	01:08
147	Bibby tyre coupling	01:08
148	Chain alignment unit	01:08
149	Double v-belt simulation	01:08
150	Flexible tyre couplings	01:12
151	Internal gear coupling	01:12
152	Laser alignment equipment	01:15
153	Rigid flange couplings	01:12
154	Single v-belt simulation	01:12
155	Tensioner pulley for Chain Drive	01:10
156	Variety of master links	01:12
157	Set Variety of shims	01:03
158	Belt tension gauge	01:07
159	Fenner Gauge	
FLUID DRIVE		
NO	ITEM DESCRIPTION	RATIO (for 30 learners)
157	Additional pneumatic valves, cylinders, faults	01:06
158	Additional pneumatic valves, cylinders, pipes	01:06
159	Additional valves and cylinders for stripping and repairing with different seals	01:06
160	Basic electro-pneumatic simulation station with different valves, cylinders, pipes	01:06
161	Electro-hydraulic simulation with valves, pipes and cylinders	01:30
162	Flow system chart	01:08
163	Hydraulic basic simulation stand and equipment	01:15
164	Hydraulic board with components	01:15
165	Intermediate electro-pneumatic simulation station with different valves, cylinders, pipes	01:15
166	Intermediate hydraulic simulation with valves, pipes and cylinders	01:15
167	Intermediate hydraulic simulation with valves, pipes and faulty equipment for faulty finding	01:15
168	Pump system operational	01:15
169	Different gland sizes	01:02
170	Different mechanical seals	01:01
171	Envirotech pump	01:15
172	Fluid drive	01:30
173	Gaskets	03:01
174	Gate valve 75-100mm	01:01
175	KSB Pump	01:06

176	Pressure test kit for gate valves	01:10
177	Warman pump	01:08
178	Centrefugal pump	01:06
179	Gear pump	01:08
180	Pump to be stripped and assembled	01:10
181	Reciprocating pump	01:15
182	Valves (optional)	01:12
BASIC LIFTING EQUIPMENT		
NO	ITEM DESCRIPTION	RATIO (for 30 learners)
183	Chain block: 2 ton max	01:30
184	Coffing block: 2 ton max	01:30
185	Shackles: 2 ton max	01:30
186	Chain clings: 2.5 ton max	01:15
187	Wire rope slings: 20mm diameter	01:15
ARC WELDING		
NO	ITEM DESCRIPTION	RATIO (for 30 learners)
188	AC/DC welding machains	01:06
189	Welding screens	01:03
190	Electrode holder	01:02
191	Earth clamps	01:02
192	Cables	01:02
193	Wire brush	01:01
194	Chipping hammer	01:03
GAS WELDING/BRAZING		
NO	ITEM DESCRIPTION	RATIO (for 30 learners)
195	Oxygen cylinder	01:06
196	Acetylene cylinder	01:06
197	Cylinder Trolley	01:06
198	Pressure regulators	01:03
199	Hoses and couplings	01:03
200	Flashback arresters	01:03
201	Torches	01:03
202	Nozzle (various sizes)	01:03
203	Nozzle cleaners	01:03
204	Spark lighter	01:03
CONSUMABLES		
NO	ITEM DESCRIPTION	RATIO (for 30 learners)
205	Appropriate packing	variety

206	bolts and nuts	variety
207	Centre drill	variety
208	Charts of risk assessment procedure and safety measures for cutting tools	variety
209	Cleaning material	variety
210	Cutting paste	variety
211	Die-nuts	variety
212	Different lockout mechanisms	variety
213	Drill bits	variety
214	First aid box	01:08
215	First aid doll	01:02
216	Flat bar for projects	variety
217	grinding wheels	variety
218	Hacksaw and blade	variety
219	Hydraulic oil	variety
220	Inspection sheets	variety
221	Maintanace Plan for Machines	variety
222	Job cards	variety
223	Key steel	variety
224	Marking blue /Engineering blue	variety
225	Marking blue past	variety
226	Risk assessment document	variety
227	Safe operating procedure and safe working procedure for cutting tools	variety
228	Samples (and charts) of different cutting tools and angle	variety
229	Scientific calculator	01:01
230	Set of Shims	01:05
231	Set of Taps (Stock & Dies)	variety
232	Sheet metal 0.5mm for marking off	variety
233	Soluble cutting oil	variety
234	Speed and feed chart	variety
235	Square bar for Taper Key	variety
236	Stationary	variety
237	Timesheets	variety
238	Dowel pins (various sizes)	variety
239	Split pins	variety
240	Taper Pins	variety
241	Electro Welding Rods	
SAFETY		
NO	ITEM DESCRIPTION	RATIO (for 30 learners)
242	Apron	01:01
245	Brazing goggles	01:01
248	Colour coding and symbolic safety signs	01:15
251	Ear plugs	03:01

254	Face shield	01:01
257	Fire extinguishers	According to OHS Inspection
260	First AID kit	01:08
263	Gas welding goggles	01:01
266	Leather gloves	01:01
269	OHS ACT	01:15
272	Safety boots	01:01
275	Safety goggles	01:01
278	Safety harness	01:10
281	Safety Shields for Machinery	According to working Machinery
284	Spats	01:01
287	Welding helmet	01:01
290	Work suites /Overalls	01:01
293	ARC welding helmet	01:01
296	Leather apron	01:01
299	Gloves	01:01
302	Spats	01:01
305	Brazing Goggles	01:01
308	Lock	01:01
311	Lockout equipment (permits)	01:01
314	Tag out board	01:01