

Industrial Mechanic (Millwright) Level 2

Industrial Mechanic (Millwright)

Unit: B1 Equipment Assembly Drawings

Level: Two

Duration: 12 hours

Theory: 6 hours

Practical: 6 hours

Overview:

This unit is designed to introduce knowledge of equipment assembly drawings, their use and interpretation.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with equipment assembly drawings.	10%
2. Identify the views found on equipment assembly drawings.	10%
3. Interpret assembly instructions on equipment assembly drawings.	15%
4. Interpret material specifications found on equipment assembly drawings.	15%
5. Assemble mechanical components as per drawing.	50%

Industrial Mechanic (Millwright)

Unit: B2 Job Planning

Level: Two

Duration: 9 hours

Theory: 9 hours

Practical: 0 hours

Overview:

This unit is designed to introduce knowledge of the procedures used to plan and organize jobs.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify sources of information relevant to job planning.	30%
a. Documentation	
b. Drawings	
c. Related professionals	
d. Clients	
2. Describe the considerations for determining job requirements.	30%
a. Personnel	
b. Tools and equipment	
c. Materials	
d. Permits	
e. Environmental	
3. Describe the procedures used to plan job tasks.	30%
a. Scheduling	
b. Estimating	
4. Describe the procedures used to organize and store tools, equipment and materials on-site.	10%

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Unit: B3 Welding II

Level: Two

Duration: 42 hours

Theory: 9 hours

Practical: 33 hours

Overview:

This unit is designed to introduce knowledge of SMAW equipment and accessories. This unit of instruction is designed to introduce knowledge the procedures used to weld, using SMAW equipment.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with SMAW.	1%
2. Identify hazards and describe safe work practices pertaining to SMAW. a. Personal b. Shop/facility c. Equipment d. Ventilation	2%
3. Identify and interpret codes and regulations pertaining to SMAW.	1%
4. Describe the SMAW welding process and its applications.	2%
5. Identify and describe SMAW equipment, consumables and accessories and describe their application.	2%
6. Perform the procedures used to set-up and adjust SMAW equipment.	2%
7. Perform the procedures used to inspect and maintain SMAW equipment.	2%
8. Identify the types of welds performed using SMAW equipment.	2%
9. Identify welding positions and describe their applications.	2%
10. Perform the procedures used to weld using SMAW equipment.	10%
11. Describe weld defects, their causes and prevention.	2%

B3.a Welding II

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with MIG welding.	1%
2. Identify hazards and describe safe work practices pertaining to MIG welding. a. Personal b. Shop/facility c. Equipment d. Ventilation	2%
3. Describe the MIG welding process and its applications. a. GMAW b. FCAW	2%
4. Identify and describe MIG equipment, consumables and accessories and describe their applications.	2%
5. Describe the procedures used to set-up, adjust and shut down MIG welding equipment.	2%
6. Describe the procedures used to inspect and maintain MIG welding equipment.	2%
7. Identify the types of welds performed using MIG welding equipment.	2%
8. Perform the procedures used to weld using MIG welding equipment.	10%
9. Describe weld defects, their causes and prevention.	1%

B3.b Welding II

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with TIG welding.	1%
2. Identify hazards and describe safe work practices pertaining to TIG welding. a. Personal b. Shop/facility c. Equipment d. Ventilation	2%
3. Describe the TIG welding process and its applications.	2%
4. Identify and describe TIG equipment, consumables and accessories and describe their applications.	2%
5. Describe the procedures used to set-up, adjust and shut down TIG welding equipment.	2%
6. Describe the procedures used to inspect and maintain TIG welding equipment.	2%

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| 7. Identify the types of welds using TIG welding equipment. | 2% |
| 8. Perform the procedures used to weld using TIG welding equipment. | 10% |
| 9. Describe weld defects, their causes and prevention. | 1% |

B3.c Welding II

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with plasma arc cutting equipment.	1%
2. Identify hazards and describe safe work practices pertaining to plasma arc cutting. <ul style="list-style-type: none"> a. Personal b. Shop/facility c. Equipment d. Ventilation 	2%
3. Describe the plasma arc cutting equipment process and its applications.	2%
4. Identify plasma arc cutting equipment and accessories and describe their applications.	2%
5. Describe the procedures used to set-up, adjust and shut down plasma arc cutting equipment	2%
6. Describe the procedures used to inspect and maintain plasma arc cutting equipment.	2%
7. Perform the procedures used to cut using plasma arc cutting equipment.	13%

Industrial Mechanic (Millwright)

Unit: B4 Lathe and Milling Machines

Level: Two

Duration: 22 hours

Theory: 4 hours

Practical: 18 hours

Overview:

This unit is designed to introduce knowledge of lathes, their accessories, attachments and applications and the procedures and calculations used to perform lathe operations.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with lathes.	2%
2. Identify hazards and describe safe work practices pertaining to lathe operations.	5%
3. Identify the types of lathes and describe their applications and operation.	2%
4. Identify lathe components, accessories and attachments and describe their applications and maintenance.	2%
5. Identify types of tool holding and work holding devices and describe their applications.	2%
6. Identify types of lathe tools and describe their characteristics and applications.	2%
7. Describe the procedures used to sharpen lathe cutting tools.	2%
8. Calculate and determine speeds, feeds and depth of cut for lathe operations.	5%
9. Describe the procedures used to set up lathes.	3%
10. Identify cutting fluids and coolants used during lathe operations.	2%
11. Perform the procedures used to perform basic lathe operations.	15%
a. Turning	
b. Boring	
c. Grooving	
d. Facing	

- e. Knurling
- f. Parting off
- g. Drilling
- h. Threading

12. Describe the procedures used to prevent and correct problems that occur when performing lathe operations. 5%

B4.a Lathe and Milling Machines

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with milling machines.	2%
2. Identify hazards and describe safe work practices pertaining to milling operations.	5%
3. Identify the types of and milling machines and describe their applications.	5%
4. Identify milling machine components, accessories and attachments and describe their applications and maintenance.	2%
5. Identify types of tool holding and work holding devices and describe their applications.	2%
6. Identify types of cutting tools and describe their applications.	2%
7. Calculate and determine speeds, feeds and depth of cut for milling operations.	6%
8. Perform the procedures used to align, secure and cut workpieces.	17%
9. Identify cutting fluids and coolants used during milling operations.	2%
10. Perform the procedures used to prevent and correct problems that occur when performing milling machine operations.	10%

Industrial Mechanic (Millwright)

Unit: B5 Lubrication Systems

Level: Two

Duration: 10 hours

Theory: 9 hours

Practical: 1 hours

Overview:

This unit is designed to introduce knowledge of lubricants and lubrication, their applications, maintenance and procedures for use. It is also designed to introduce knowledge of lubrication components and their applications.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with lubricants and lubrication systems.	10%
2. Explain the principles of friction and its effects on surfaces in contact.	15%
3. Identify types of lubricants and describe their applications.	15%
a. Oil	
b. Grease	
c. Dry solids	
4. Identify the properties and characteristics of lubricants.	15%
a. Adhesion/cohesion	
b. Viscosity	
c. Additives and inhibitors	
d. Penetration	
e. Dropping point	
f. Flash point	
g. Classifications and grades	
5. Identify types of lubrication systems and describe their characteristics and applications.	15%
6. Identify sources of information relating to system lubricant and lubrication requirements.	15%
a. Technical manuals	
b. Manufacturers' specifications	
7. Describe the procedures and regulatory requirements to handle, store, recycle and dispose of lubricants and fluids.	15%

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Unit: B6 Shaft Alignment I

Level: Two

Duration: 19 hours

Theory: 6 hours

Practical: 13 hours

Overview:

This unit is designed to introduce knowledge of shaft alignment using the straight edge and feeler gauge method and the procedures for shaft alignment using the rim and face dial method.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with shaft alignment.	5%
2. Identify hazards and describe safe work practices pertaining to shaft alignment.	5%
3. Identify tools and equipment used for shaft alignment and describe their applications and procedures for use.	10%
4. Perform the procedures used to determine shaft alignment.	20%
5. Perform various types of alignment methods and applications.	20%
a. Straight edge and feeler gauge	
b. Rim and face dial	
c. Reverse dial	
d. Cross dial	
e. Laser	
6. Perform the procedures used to align shafts using the straight edge and feeler gauge method.	20%
a. Pre-alignment checks	
b. Select tools and equipment	
c. Perform calculations	
d. Make adjustments	
7. Perform the procedures used to align shafts using the rim and face dial method.	20%
a. Pre-alignment checks	
b. Select tools and equipment	
c. Perform calculations	
d. Make adjustments	

Industrial Mechanic (Millwright)

Unit: B7 Bearings, Seals and Gaskets

Level: Two

Duration: 26 hours

Theory: 13 hours

Practical: 13 hours

Overview:

This unit is designed to introduce knowledge of bearings and their applications. It is also designed to introduce knowledge of the procedures used to remove, install, maintain, troubleshoot and repair bearings.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with bearings.	3%
2. Identify hazards and describe safe work practices pertaining to bearings.	3%
3. Identify types of bearings and describe their applications.	3%
4. Identify types of bearing housings and describe their applications.	3%
5. Identify types of bearings fits and describe their applications.	5%
6. Perform the procedures with various types of tools and equipment used to remove, install, maintain, troubleshoot and repair bearings and describe their applications and procedures for use.	5%
7. Perform the procedures used to remove and install bearings.	5%
8. Perform the procedures used to inspect and maintain bearings.	7%
9. Perform the procedures used to troubleshoot bearing problems.	7%
10. Identify the considerations for determining if bearing repair or replacement is required.	5%
11. Perform the procedures used to repair bearings.	7%

B7.a Bearings, Seals and Gaskets

Overview:

This unit is designed to introduce knowledge of seals and gaskets and their applications. It is also designed to introduce knowledge of the procedures used to remove and install seals and gaskets.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with seals and gaskets.	3%
2. Identify hazards and describe safe work practices pertaining to seals and gaskets.	3%
3. Perform the procedures for applications with various types of seals. a. Static b. Dynamic c. Mechanical d. Non-contacting (labyrinth/annulus)	5%
4. Identify types of gaskets and describe their applications.	5%
5. Perform the procedures used to remove and install seals and gaskets.	7%
6. Perform the procedures used to fabricate gaskets.	7%
7. Perform the procedures used to remove and install seals and gaskets.	7%
8. Identify the considerations for determining if mechanical seal repair or replacement is required.	5%
9. Perform the procedures used to repair mechanical seals.	7%

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Unit: B8 Couplings and Shafts

Level: Two

Duration: 47 hours

Theory: 21 hours

Practical: 26 hours

Overview:

This unit is designed to introduce knowledge of couplings and their applications. This unit of instruction is designed to introduce knowledge the procedures to remove, install, maintain, troubleshoot and repair couplings.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with couplings.	5%
2. Identify hazards and describe safe work practices pertaining to couplings. a. Verify equipment/system safety components <ul style="list-style-type: none">• Guards• Emergency stops• Overrun switches	5%
3. Identify types of couplings and describe their applications.	7%
4. Identify tools and equipment used to remove, install, maintain, troubleshoot and repair/replace couplings and describe their applications and procedure for use.	6%
5. Perform the procedures used to remove and install key and keyless couplings.	12%
6. Perform the procedures used to inspect and maintain couplings.	3%
7. Perform the procedures used to troubleshoot couplings.	23
8. Identify the consideration for determining if coupling repair or replacement is required.	5%
9. Perform the procedures used to repair couplings.	5%

B8.a Couplings and Shafts

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with shafts and accessories.	3%
2. Identify hazards and describe safe work practices pertaining to shafts.	4%
3. Identify types of couplings and describe their applications. a. Drive b. Counter c. Jack d. Hollow	5%
4. Identify shaft accessories. a. Keys b. Pins c. Taper lock bushings d. Retaining rings e. Sleeves	5%
5. Identify tools and equipment used to remove, install, maintain, and repair shafts and describe their applications and procedures for use.	7%
6. Perform the procedures used to remove and install shafts.	7
7. Perform the procedures used to inspect and maintain shafts.	7%
8. Identify the considerations for determining if shaft repair or replacement is required.	5%
9. Perform the procedures used to repair shafts.	7%

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Unit: B9 Clutches and Brakes

Level: Two

Duration: 35 hours

Theory: 16 hours

Practical: 19 hours

Overview:

This unit is designed to introduce knowledge of couplings and their applications and the procedures to remove, install, maintain, troubleshoot and repair couplings.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with clutches and brakes.	5%
2. Identify hazards and describe safe work practices pertaining to clutches and brakes.	5%
3. Identify types of clutches and brakes and describe their applications. a. Overrunning b. Friction c. Positive contact d. Fluid	10%
4. Identify types of brakes and describe their applications. a. Friction b. Fluid/wet disc c. Electromagnetic	10%
5. Identify tools and equipment used to remove, install, maintain, troubleshoot and repair clutches and brakes and describe their applications and procedures for use.	10%
6. Perform the procedures used to remove and install clutches and brakes.	12%
7. Perform the procedures used to inspect and maintain clutches and brakes.	12%
8. Perform the procedures used to troubleshoot clutches and brakes.	13%
9. Identify the considerations for determining if clutch and brake repair or replacement is required.	10%
10. Describe the procedures used to repair clutches and brakes.	13%

Industrial Mechanic (Millwright)

Unit: B10 Chain and Belt Drive Systems and Gear Drives

Level: Two

Duration: 38 hours

Theory: 19 hours

Practical: 19 hours

Overview:

This unit is designed to introduce knowledge of chain and belt drive systems, their components and operation and the procedures used to remove, install, maintain, troubleshoot and repair chain and belt drive systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with chain and belt drive systems.	3%
2. Identify hazards and describe safe work practices pertaining to chain and belt drive systems.	3%
3. Identify the types of chain drive systems and describe their applications. a. Roller b. Silent	3%
4. Identify chain drive system components and accessories describe their applications.	4%
5. Identify belt drive systems, their components and accessories and describe their applications. a. V-belt drive b. Cog belt (timing) drive c. Flat belt drive	4%
6. Identify formulae and perform calculations. a. Belt/chain lengths b. Speed and torque ratios	3%
7. Identify tools and equipment used to remove, install, maintain, troubleshoot and repair chain and belt drive systems and describe their applications and procedures for use.	3%
8. Perform the procedures used to remove and install chain and belt drive systems and their components.	7%

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| 9. | Perform the procedures used to inspect and maintain chain and belt drive systems and their components. | 6% |
| 10. | Perform the procedures used to troubleshoot chain and belt drive systems and their components. | 6% |
| 11. | Perform the considerations for determining if chain and belt drive system component repair or replacement is required. | 3% |
| 12. | Perform the procedures used repair chain and belt drive systems and their components. | 5% |

B10.a Chain and Belt Drive Systems and Gear Drives

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with gear and gear drives.	3%
2. Identify hazards and describe safe work practices pertaining to gear drives.	3%
3. Identify the types of gear and describe their applications.	3%
<ul style="list-style-type: none"> a. Spur b. Bevel c. Spiral d. Herringbone e. Helical f. Worm 	
4. Identify types of gear drives and describe their components, applications and operation.	4%
<ul style="list-style-type: none"> a. Planetary b. Worm c. Parallel shaft d. Crown and pinion 	
5. Identify formulae and perform calculations.	4%
<ul style="list-style-type: none"> a. Belt/chain lengths b. Installation specifications of simple and compound gear trains 	
6. Identify tools and equipment used to remove, install, maintain, troubleshoot and repair gear drives and describe their applications and procedures for use.	3%
7. Perform the procedures used to remove and install gears and gear drives and their components.	3%
8. Perform the procedures used to inspect and maintain gears and gear drives and their components.	7%
<ul style="list-style-type: none"> a. Monitor temperature b. Perform vibration analysis c. Check lubrication d. Check contact patterns 	

e. Adjust clearance and backlash

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| 9. Perform the procedures used to troubleshoot gears and gear drives and their components. | 6% |
| 10. Identify the considerations for determining if gears drive component repair or replacement is required. | 6% |
| 11. Perform the procedures used repair gears and gear drives and their components. | 3% |
| 12. Perform the procedures used commission gear drives. | 5% |

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Unit: B11 Conveying Systems

Level: Two

Duration: 20 hours

Theory: 5 hours

Practical: 15 hours

Overview:

This unit is designed to introduce knowledge of conveying systems, their components and operation and the procedures used to remove, install, maintain, troubleshoot, repair and commission conveying systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with conveying systems.	5%
2. Identify hazards and describe safe work practices associated with conveying systems.	10%
3. Identify the types of conveying systems and describe their applications and operation. a. Pneumatic b. Belt c. Rollers d. Chain e. Screw f. Bucket g. Flume/water	20%
4. Identify conveying systems components and accessories and describe their purpose and operation.	10%
5. Identify tools and equipment used to remove, install, maintain, troubleshoot and repair conveying systems and components and describe their applications and procedures for use.	5%
6. Identify the factors to consider and required calculations to determine conveying system requirements.	5%
7. Perform the procedures used to remove and install conveying systems and their components.	10%
8. Perform the procedures used to inspect and maintain conveying systems and their components.	5%

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| 9. Perform the procedures used to troubleshoot conveying systems and their components. | 5% |
| 10. Perform the procedures used repair conveying systems and their components. | 20% |
| 11. Perform the procedures used commission conveying systems. | 5% |
