# OCCUPATIONAL FRAMEWORK
# SECTION C: MANUFACTURING
# DIVISION 33: REPAIR AND INSTALLATION OF MACHINERY & EQUIPMENT

**JABATAN PEMBANGUNAN KEMAHIRAN**
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Occupational Framework
Repair and Installation of Machinery and Equipment
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**ABSTRACT**

An Occupational Framework is the outcome of Occupational Analysis of identifying the work scope of the occupational areas in terms of competencies. It is used to analyse skilled human resource competency requirement for the sector. The development of the Occupational Structure is a preliminary process in developing relevant National Occupational Skills Standard (NOSS). The NOSS in turn will be developed to be used as the basis to conduct skills training and certification of competent personnel. This document is divided into several chapters, the first two chapters being an industrial overview highlighting the definition and scope of the sector, the current analysis of the local sector and its skilled worker requirements, Government bodies and development plans supporting the growth of the sector, then the next chapter will explain the methodology used in Occupational Framework development such as qualitative analysis through brainstorming discussion sessions. Workshops were held to get a better understanding of the organisational structure, job titles, hierarchy objectives and main activities of the specified positions. The final chapters will present the findings of the Occupational Framework that is translated into the Occupational Structures, levels of competencies and critical job areas. These findings will in turn be the basis of reference for the development of the National Occupational Skills Standard (NOSS) document. The NOSS will serve not only as a reference of skills standards for certification but also as a guide to develop the skills training curriculum. In order to conduct the Occupational Framework on the Machinery & Equipment Sector all the information related to the aforesaid sector was gathered through literature review, surveys and further discussed in workshop sessions with experts from the sector. The Machinery and Equipment (M&E) industry has been of strategic importance throughout the global industrialization revolutions as one of the fundamental enablers for all economic segments such as the primary, manufacturing and services industries. The M&E industry represents one of the most innovative sectors in the economy which combines all of the key future technologies including electronics, robotics, materials and software integration and thus a key player in the next industrial revolution - Industry 4.0. The total number of job area identified is 51 with 200 job titles. A total of 26 job titles identified as relevant to Industry 4.0.

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| | |
|---|---|
| **CGI** | Computer-Generated Imagery |
| **DESCUM** | Development of Standard and Curriculum |
| **DSD** | Department of Skills Development |
| **ISIC** | International Standard Industrial Classification |
| **OF** | Occupational Framework |
| **OD** | Occupational Description |
| **OS** | Occupational Structure |
| **MOSQF** | Malaysian Occupational Skills Qualification Framework |
| **MQA** | Malaysia Qualification Agency |
| **MSC** | Malaysian Skills Certificate |
| **MSIC** | Malaysian Standard Industrial Classification |
| **M&E** | Machinery & Equipment |
| **NOSS** | National Occupational Skills Standard |

# CHAPTER 1: INTRODUCTION

## 1.1 Chapter Introduction

This chapter will explain the objectives, scope and problem statement of the Occupational Framework specifically for the Repair and Installation of Machinery & Equipment industry. The concept of Occupational Framework and its function in skills training and curriculum development is also elaborated in this chapter.

Below are descriptions of important elements of the research.

### 1.1.1 Research Background

There have been various National Occupational Skills Standard (NOSS) documents developed for this area. The analysis on the Occupational Structure of this area of specialisation under Ministry of Human Resources has never been done. This study and analysis are important to ensure the Occupational Framework is in line with the development of the NOSS based on MSIC sections and divisions, therefore this research aims to define the industry as specified in the MSIC based on qualitative research on its Occupational Structure, Critical Jobs and Skills in Demand.

### 1.1.2 National Skills Development Act 2006 (Act 652)

The National Skills Development Act 2006 (Act 652) came into effect on 1st September 2006 after it was officially gazetted on 29th June 2006, with the mandate of promoting, through skills training, the development and improvement of a person's abilities, which are needed for vocation, and to provide for other matters connected therewith. The Act 652 is significant because for the first time in the history of skills training in Malaysia, a national legislation has been enacted solely and exclusively for skills training and development. In addition, the meaning and scope of skills training has been clarified and given a statutory interpretation that can be used to distinguish it from other components of the country's national education and training system. The Act 652 also provides for the implementation of a Malaysian Skills Certification System, leading to the award of five (5) levels of national skills qualification, namely Malaysian Skills Certificate Level 1,2 and 3; Malaysian Skills Diploma; and Malaysian Skills Advanced Diploma.

### 1.1.3 Malaysian Qualification Act, 2007 (Act 679)

The Malaysia Qualification Framework refers to the policy framework that satisfies both the national and international recognized qualifications. It comprises of titles and guidelines, together with principles and protocols covering articulation and issuance of qualifications and statements of attainment. Element of qualification framework indicate the achievement for each qualification title. It will also provide progression routes for all the graduates in the respective occupational fields.

The MQF has eight levels of qualification in three sectors and supported by lifelong education pathways as shown in the chart 1. JPK governs the skills sector, in which there are five (5) levels of skills qualification. The definition for each level of skills qualification is specified in Malaysian Occupational Skills Qualification Framework (MOSQF).

<table>
<tr><th rowspan="2">MQF Levels</th><th colspan="3">SECTORS</th><th rowspan="2">LIFELONG LEARNING</th></tr>
<tr><th>Skills</th><th>Vocational and Technical</th><th>Higher Education</th></tr>
<tr><td>8</td><td rowspan="3"></td><td rowspan="3"></td><td>Doctoral Degree</td><td rowspan="10">Accreditation of Prior Experiential Learning (APEL)</td></tr>
<tr><td>7</td><td>Masters Degree</td></tr>
<tr><td>6</td><td>Bachelor’s Degree</td></tr>
<tr><td>5</td><td>Malaysian Advanced Skills Diploma</td><td>Advanced Diploma</td><td>Advanced Diploma</td></tr>
<tr><td>4</td><td>Malaysian Skills Diploma</td><td>Diploma</td><td>Diploma</td></tr>
<tr><td>3</td><td>Malaysian Skills Certificate 3</td><td>Vocational and Technical Certificate</td><td>Certificate</td></tr>
<tr><td>2</td><td>Malaysian Skills Certificate 2</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>1</td><td>Malaysian Skills Certificate 1</td></tr>
</table>

Figure 1.1: MQF Chart

### 1.1.4 National Occupational Skills Standard (NOSS)

National Occupational Skills Standard (NOSS) is defined as a specification of the competencies expected of a skilled worker who is gainfully employed in Malaysia for an occupational area, level and pathway to achieve the competencies and is gazetted in Part IV of National Skills Development Act 652. NOSS is developed by the sector experts based on the needs of the sector and is utilized as the main tool in the implementation of Malaysian Skills Certification System in which the performance of existing sector workers and trainees are assessed based on NOSS for awarding of Malaysian Skills Certificate.

### 1.1.5 Competency Based Training (CBT)

Competency Based Training (CBT) is an approach to vocational training which emphasizes on what a person can do in a work place as a result of education and training obtained. CBT is based on performance standards which are set by the sector with main focus on measuring the performance while considering knowledge and attitude rather than the duration taken to complete the course. CBT is a learner-centric; outcome-based approach to training which allows each individual to develop skills at their own pace for a similar outcome, thus meaning training practices can be customized for each individual to achieve a similar outcome. CBT concept is the basis of Malaysian Skills Certification system which is coordinated by JPK.

### 1.1.6 Occupational Framework (OF)

The Occupational Framework (OF) is described as the outcome of the occupational analysis process to identify the occupational structure of an industry. The OF which was previously known as Occupational Analysis (OA) consists of Occupational Structure (OS), Occupation Description (OD) and Skills in Demand.

The development of the OF is a preliminary process in developing relevant NOSS. Once developed, the NOSS can be used as the basis to conduct skills training and skills certification of competent personnel.

### 1.1.7 Malaysian Standard Industrial Classification (MSIC)

The MSIC is intended to be a standard classification of productive economic activities. Its main purpose is to provide a set of activity categories that can be utilised for the collection and presentation of statistics according to such activities. Therefore, MSIC aims to present these set of activity categories in such a way that entities can be classified according to the economic activity that they carry out. For purposes of international comparability, the MSIC 2008 Version 1.0 conforms closely to the International Standard Industrial Classification of All Economic Activities (ISIC) Revision 4, published by the United Nations Statistics Division, with some modifications to suit national requirements. The objective of an industrial classification system is to classify data in respect of the economy according to categories of activities and the characteristics of which will be similar. The MSIC is a classification of all types of economic activities and is not a classification of goods & services nor is it a classification of occupations.[1]

## 1.2 Objective of Study

The objectives of the study are as below:

a. To produce occupational structure (OS) from data analysis, interviews, site visits and focus group;

b. To determine job descriptions of each job title from the OS; and

c. To investigate the skills in demand in the sector.

## 1.3 Scope of Study

The scope of work for the study to develop occupational framework are as listed below:

a. To conduct literature review on the current sector;

b. To consult with relevant sector representatives to obtain expert input for determined sector;

[1] Department of Statistics Malaysia. (2008). Malaysia Standard Industrial Classification (MSIC).

c. To develop, disseminate and analyse survey and questionnaire's data from industries via sector representatives;

d. To perform focus group discussion with the sector representatives, interviews, and/or any other methods in order to achieve the study outcome.

## 1.4 Justification for MSIC Section Selection

The selection of MSIC's Section C, Manufacturing and Division 33 for this study is based on the following justifications:

a. The scope of Repair and Installation of Machinery and Equipment industry is in tandem with description of Division 33 under Section C: The division includes the specialized repair of goods produced in the manufacturing sector with the aim to restore machinery, equipment and other products to working order. The provision of general or routine maintenance (i.e. servicing) on such products to ensure they work efficiently and to prevent breakdown and unnecessary repairs is included.

b. Division 33 excluded the manufacturing aspect of the machinery and equipment. This division specifically focuses on the economic activities of repairing and installing the machinery and equipment.

c. The current NOSS registry as published in i-NOSS (retrieved in April 2018) has grouped specific NOSS under division 33. The complete list of NOSS developed under this division is laid out in Chapter 2 under sub topic 2.5.

## 1.5 Chapter Conclusion

The gist in this chapter is the foundation of this study in which it explored on the legislations and requirements that regulate the objectives and the scope of the study. The elaboration is to give a clear picture and direction of skills training in Malaysia.

This study will revolve around the effort of defining and set the boundaries of job titles existed in this division. The outcome of this study is the Occupational Structure which consist of related job titles and description of those job titles.

This study is using Malaysia Standard Industry Classification (MSIC) published by Department of Statistics Malaysia. This will help the Occupational Framework to be

in sync and stay coherent with the national and international classification of the industry. Ultimately this study will be helpful for the related stakeholders in taking actions to develop and upgrade skilled personnel in Malaysia.

# CHAPTER 2: LITERATURE REVIEW

## 2.1 Chapter Introduction

This chapter will emphasis on the explanation of the Machinery & Equipment Sector focusing on the current scenario in Malaysia, introduction to government policies, development plans, government bodies and competitiveness at international level.

Findings in this chapter were obtained via literature review, observation, interviews with sector practitioners and discussions during workshops with development panel members. This literature review will be further discussed with panel members to obtain insight on the matters at hand from a practitioner's perspective.

## 2.2 Definition of Research Area

The research area is focusing on activities of repairing and installing of machinery and equipment. As stated earlier the definition of the research area is aligned with MSIC. Based on MSIC 2008, definition and scope of coverage for the Occupational Framework is as follows: -

| | | |
|---|---|---|
| MSIC Section | C | Manufacturing |
| MSIC Division | 33 | Repair and Installation of Machinery and Equipment |
| MSIC Group | 331 | Repair of fabricated metal products, machinery and equipment |
| | 332 | Installation of industrial machinery and equipment |

The division includes the specialized repair of goods produced in the manufacturing sector with the aim to restore machinery, equipment and other products to working order. The provision of general or routine maintenance (i.e. servicing) on such products to ensure they work efficiently and to prevent breakdown and unnecessary repairs is included.

This division does only include specialized repair and maintenance activities. A substantial amount of repair is also done by manufacturers of machinery, equipment and other goods, in which case the classification of units engaged in these repair and manufacturing activities is done according to the value-added

principle which would often assign these combined activities to the manufacture of the good. The same principle is applied for combined trade and repair. The rebuilding or remanufacturing of machinery and equipment is considered a manufacturing activity and included in other divisions of this section [2].

Repair and maintenance of goods that are utilized as capital goods as well as consumer goods is typically classified as repair and maintenance of household goods (e.g. office and household furniture repair, see 9524). Also included in this division is the specialized installation of machinery. However, the installation of equipment that forms an integral part of buildings or similar structures, such as installation of electrical wiring, installation of escalators or installation of air-conditioning systems, is classified as construction. This division excludes the cleaning of industrial machinery (see class 8129) and the repair and maintenance of computers, communications equipment and household goods (see division 95)[3].

## 2.3 Scope of Occupational Framework Based on MSIC 2008

Most manufacturing activities involve the production of a good or industrial service that transforms intermediate goods; by contrast, the repair and installation activities covered in this document are industrial services that generally relate to new or used capital goods.

The table below is an excerpt taken from MSIC 2008 as to illustrate the scope of this Occupational Framework.

Table 2.1: MSIC Section, Division and Group

| Classification | Code | Description |
|---|---|---|
| **Section** | **C** | **Manufacturing** |
| **Division** | **33** | **Repair and Installation of Machinery and Equipment** |
| **Group** | **331** | **Repair of fabricated metal products, machinery and equipment**<br>This group includes the specialized repair of goods produced in the manufacturing sector with the aim to restore these metal products, machinery, equipment and other products to working order. The provision of general or routine maintenance (i.e. servicing) on such products to ensure they work efficiently and to prevent breakdown and unnecessary repairs is included. |
| **Class** | **3311** | **Repair of fabricated metal products**<br><br>**Includes:** |

[2] Department of Statistics Malaysia. (2008). Malaysia Standard Industrial Classification (MSIC). p.C-150
[3] Ibid. p.C-151

| | | |
|---|---|---|
| | | a) repair of metal tanks, reservoirs and containers<br>b) mobile welding repair<br>c) repair of steel shipping drums<br>d) repair and maintenance of steam or other vapour generators<br>e) repair and maintenance of auxiliary plant for use with steam generators (e.g. condenser, accumulators, etc.)<br>f) repair and maintenance of nuclear reactors, except isotope separators<br>g) repair and maintenance of parts for marine or power boilers plate work repair of central heating boilers and radiators<br>h) repair and maintenance of shopping carts<br>**Excludes:**<br>a) repair of central heating systems, etc., see 43221<br>b) repair of mechanical locking devices, safes, etc., see 80200 |
| **Class** | **3312** | **Repair of machinery**<br><br>**Includes:**<br>a) repair and maintenance of non-automotive engines<br>b) repair and maintenance of pumps and related equipment<br>c) repair of valves, gearing and driving elements<br>d) repair and maintenance of industrial process furnaces<br>e) repair and maintenance of materials handling equipment<br>f) repair and maintenance of commercial refrigeration equipment and air purifying equipment<br>g) repair and maintenance of commercial-type general purpose machinery<br>h) repair of other power-driven hand-tools<br>i) repair and maintenance of metal cutting and metal forming machine tools and accessories<br>j) repair and maintenance of other machine tools, agricultural tractors, agricultural machinery and forestry and logging machinery, metallurgy machinery<br>k) repair and maintenance of mining, construction, and oil and gas field machinery, food, beverages and tobacco processing machinery textile apparel and leather production machinery, papermaking machinery, fire arms and ordnance (including repair of sporting and recreational guns)<br>l) repair and maintenance of other special purpose machinery of division 28<br>m) repair and maintenance of weighing equipment<br>n) repair and maintenance of vending machines<br>o) repair and maintenance of cash registers<br>p) repair and maintenance of photocopy machines<br>q) repair of calculators, electronic or not, typewriters<br>r) repair and maintenance of other machinery and equipment n.e.c.<br><br>**Excludes:** |

| | | |
|---|---|---|
| | | a) installation, repair and maintenance of furnaces and other heating equipment, see 4322<br>b) installation, repair and maintenance of elevators and escalators, see 43291 |
| **Class** | **3313** | **Repair of electronic and optical equipment**<br><br>**Excludes:**<br>a) repair of photocopy machines, see 33120<br>b) repair and maintenance of computers and peripheral equipment, see 95111<br>c) repair of computer projectors, see 95111<br>d) repair and maintenance of communication equipment, see 9512<br>e) repair of commercial TV and video cameras, see 95127<br>f) repair of house hold-type video cameras, see 95214<br>g) repair of watches and clocks, see 95294 |
| **Item** | **33131** | **Repair and maintenance of the measuring, testing, navigating and control equipment**<br><br>**Includes:**<br>a) repair and maintenance of aircraft engine instruments<br>b) repair and maintenance of automotive emissions testing equipment<br>c) repair and maintenance of meteorological instruments<br>d) repair and maintenance of physical, electrical and chemical properties<br>e) testing and inspection equipment<br>f) repair and maintenance of surveying instrument<br>g) repair and maintenance of radiation detection and monitoring<br>h) instruments<br>i) repair of time clocks, time/date stamps, time locks and similar time<br>j) recording devices |
| **Item** | **33132** | **Repair and maintenance of irradiation, electro medical and electrotherapeutic equipment**<br><br>**Includes:**<br>a) repair and maintenance of magnetic resonance imaging equipment<br>b) repair and maintenance of medical ultrasound equipment<br>c) repair and maintenance of pacemakers<br>d) repair and maintenance of hearing aids<br>e) repair and maintenance of electrocardiographs<br>f) repair and maintenance of electro medical equipment<br>g) repair and maintenance of irradiation apparatus<br>h) repair and maintenance of apparatus and equipment n.e.c. |

| | | |
|---|---|---|
| **Item** | **33133** | **Repair of optical instruments and photographic equipment**<br><br>**Includes:**<br>a) repair of binoculars, microscopes (except electron, proton), telescopes, prisms and lenses (except ophthalmic)<br>b) repair of photographic equipment (if the use mainly commercial) |
| **Class** | **3314** | **Repair of electrical equipment**<br><br>**Includes:**<br>a) repair and maintenance of power, distribution and specialty transformers<br>b) repair and maintenance of electric motors, generators and motor generator sets<br>c) repair and maintenance of switchgear and switchboard apparatus<br>d) repair and maintenance of relays and industrial controls<br>e) repair and maintenance of primary and storage batteries<br>f) repair and maintenance of electric lighting equipment<br>g) repair and maintenance of current-carrying wiring devices and noncurrent-carrying wiring devices for wiring electrical circuits<br><br>**Excludes:**<br>a) repair and maintenance of computers and peripheral computer equipment, see 95111<br>b) repair and maintenance of telecommunications equipment, see 9512<br>c) repair and maintenance of consumer electronics, see 9521<br>d) repair of watches and clocks, see 95294 |
| **Class** | **3315** | **Repair of transport equipment, except motor vehicles**<br><br>**Includes:**<br>a) repair and routine maintenance of ships<br>b) repair and maintenance or alteration of pleasure boats<br>c) repair and maintenance of locomotives and railroad cars (except factory rebuilding or factory conversion)<br>d) repair and maintenance of aircraft (except factory conversion, factory overhaul, factory rebuilding)<br>e) repair and maintenance of aircraft engines<br>f) repair of animal drawn buggies and wagons<br><br>**Excludes:**<br>a) factory rebuilding of ships, see 30110<br>b) factory rebuilding of locomotives and railroad cars, see 30200<br>c) factory rebuilding of aircraft, see 30300<br>d) repair and maintenance of shopping carts, see 33110 |

| | | |
|---|---|---|
| | | e) ship scaling, dismantling, see 38302<br>f) repair and maintenance of motorcycles, see 45403<br>g) repair of bicycles, see 95291 |
| **Class** | **3319** | **Repair of other equipment**<br><br>**Includes:**<br>a) repair of fishing nets, including mending<br>b) repair or ropes, riggings, canvas and tarps<br>c) repair of fertilizer and chemical storage bags<br>d) repair or reconditioning of wooden pallets, shipping drums or barrels, and similar items<br>e) repair of pinball machines and other coin-operated games<br>f) restoring of organs and other historical musical instruments<br>g) repair and maintenance of other equipment n.e.c.<br><br>**Excludes:**<br>a) repair of household and office type furniture, furniture restoration, see 95240<br>b) repair of bicycles, see 95291<br>c) repair and alteration of clothing, see 95292 |
| **Group** | **332** | **Installation of industrial machinery and equipment**<br><br>This group includes the specialized installation of machinery. However, the installation of equipment that forms an integral part of buildings or similar structures, such as installation of escalators, electrical wiring, burglar alarm systems or air-conditioning systems, is classified as construction.<br><br>**Includes:**<br>a) installation of industrial machinery in industrial plant<br>b) dismantling large-scale machinery and equipment<br>c) activities of millwrights<br>d) machine rigging<br>e) installation of bowling alley equipment<br>f) installation of industrial process control equipment<br>g) installation of other industrial machinery and equipment n.e.c.<br><br>**Excludes:**<br>a) installation of electrical wiring, burglar alarm system, see 43211, 43216<br>b) installation of air-conditioning system, see 43225<br>c) installation of elevators, escalators, automated doors, vacuum cleaning systems, etc, see 4329<br>d) installation of doors, staircases, shop fittings, furniture, etc, see 43301<br>e) installation (setting-up) of personal computers, see 62099 |

## 2.4 Key Stakeholders

The key stakeholders for Machinery and Equipment industry in Malaysia comprises of government agencies, regulatory bodies, industry associations and professional bodies.

### 2.4.1 Government Agencies and Regulatory Bodies

These are the Government Agencies that are empowered by the legislations according to the scope and powers given in the related acts that directly regulates the Machinery & Equipment Sector in Malaysia.

Table 2.2: List of Stakeholder in Machinery & Equipment Sector

| NO. | ORGANISATIONS | OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES |
|---|---|---|
| **1.** | Malaysian Investment Development Authority (MIDA) | Incorporated as a statutory body under the Malaysian Industrial Development Authority (MIDA) Act, the establishment of MIDA in 1967 was hailed by the World Bank as "the necessary impetus for purposeful, positive and coordinated promotional action" for Malaysia's industrial development. Today, MIDA's is Malaysia's cutting-edge, dynamic and pioneering force in opening pathways to new frontiers around the globe.<br>MIDA assists companies which intend to invest in the manufacturing and services sectors, as well as facilitates the implementation of their projects. The wide range of services provided by MIDA include providing information on the opportunities for investments, as well as facilitating companies which are looking for joint venture partners[4]. |
| **2.** | Department of Occupational Safety and Health (DOSH) | A department under the Ministry of Human Resources. This department is responsible for ensuring the safety, health and welfare of people at work as well as protecting other people from the safety and health hazards arising from the activities from various sectors. As a government agency, the department is responsible for the administration and |

[4] Malaysian Investment Development Authority (MIDA). (2018, March 12). Retrieved from http://www.mida.gov.my/home/about-mida/posts/

| | | |
|---|---|---|
| | | enforcement of legislations related to occupational safety and health of the country, with a vision of becoming an organisation which leads the nation in creating a safe and healthy work culture that contributes towards enhancing the quality of working life[5]. |
| **3.** | Department of Environment (DOE) | The main function of the DOE is to prevent, eliminate, control pollution and improve the environment, consistent with the purposes of the Environmental Quality Act 1974 and the regulations there under DOE is also responsible for the implementation of the resolutions decided by the conventions of the international environment such as Vienna Convention for the protection of the Ozone Layer 1985, Montreal Protocol on Substances That Deplete the Ozone Layer, 1987, the Basel Convention on the Transboundary Movement of Hazardous Waste and Their Disposal Act 1989 and other areas while the success of programs of bilateral cooperation and multilateral cooperation between Indonesia, Singapore and other ASEAN countries on environmental management[6]. |
| **4.** | Royal Malaysian Customs Department (RMCD) | RMCD plays a role in driving economic growth and safeguarding security country and people's well-being through three main functions as follows:<br>i. Collecting government revenue – collecting revenue from Import Duty, Export Duty, Excise Duty, GST (since 1 April 2015), Windfall Profit Levy, Vehicle Levy, Non-Tax Revenue and State/Trust Fund Revenue.<br>ii. Providing facilitation to commercial & industrial sector – giving tax facility, tax exemption on raw materials and industrial machineries, export & import trades, tax reimbursement and customs facilities in line with current government's policy. |

[5] Department of Occupational Safety and Health (DOSH). (2018, March 12). Retrieved from http://www.dosh.gov.my

[6] Department of Environment (DOE). (2018, March 12). Retrieved from https://www.doe.gov.my/portalv1/en/tentang-jas/pengenalan/perkhidmatan-teras

| | | |
|---|---|---|
| | | iii. Enforcing the legislations – enforcing Customs Act 1967, Excise Act 1976, Free Zone Act 1990, Sales Tax Act 1972, Service Act 1975, Goods Vehicle Levy Act 1983, Windfall Profit Levy Act 1998, Goods and Services Tax Act 2014 and other subsidiaries legislations related to customs and excise[7]. |

[7] Royal Malaysian Customs Department (RMCD). (2018, March 12). Retrieved from http://www.customs.gov.my/en/ci/Pages/ci_cd.aspx

### 2.4.2 Industry Associations and Professional Bodies

There is only one industry association that is related to this industry. The role and responsibilities of the association are described below:

Table 2.3: MEMA and its Function

| NO. | ORGANISATIONS | OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES |
|---|---|---|
| **1.** | Machinery and Equipment Manufacturers Association of Malaysia (MEMA) | MEMA was formed under the name Heavy Equipment and Machinery Manufacturers Association of Malaysia (HEMMAM) on 22nd June 1998 as a result of the Malaysian government desire to further promote and enhance the development of the Machinery and Equipment (M& E) industries in the Second Industrial Malaysia Plan (IMP2). The name of the Association was later amended to Machinery and Equipment Manufacturers Association of Malaysia (MEMA) on 5th December 2003 to facilitate small and medium industries in similar sector to join MEMA membership. To date MEMA memberships comprises companies from various states of Malaysia. The objectives of MEMA are as follows:<br>i. To promote cooperation among manufacturers of Machinery and Equipment in Malaysia.<br>ii. To promote development of machineries and equipment manufacturers through information dissemination, research and development and upgrade the level of technology of members.<br>iii. To serve as channel of communication between the Government and Members.<br>iv. To protect and promote commercial interest of its members.<br>v. To promote the interest of the manufacturers in the ASEAN Region through the ASEAN Chambers of Commerce and Industry (ACCI).<br>vi. To promote industrial linkages programme in cooperation with small and medium scale industries.<br>vii. To promote skills and awareness programme in the |

| NO. | ORGANISATIONS | OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES |
|---|---|---|
| | | education system.<br>viii. To promote the interest and product of members to the international market.[8] |

## 2.5 GOVERNMENT LEGISLATIONS, POLICIES AND INITIATIVES

It is imperative that, this research has to refer to legislations, by-laws and policies that are directly related to Machinery & Equipment Sector.

### 2.5.1 Government Legislations

The following legislations are relevant to the division of Repair and Installation of Machinery and Equipment

Table 2.4: List of Legislations and the related Enforcement Agency in Machinery & Equipment Sector

| NO. | LEGISLATIONS | ENFORCEMENT AGENCY | DESCRIPTION OF LEGISLATIONS |
|---|---|---|---|
| **1.** | Factories and Machinery Act 1967 (Revised 1974) | Department of Occupational Safety and Health (DOSH) | An Act to provide for the control of factories with respect to matters relating to the safety, health and welfare of person therein, the registration and inspection of machinery and for matters connected therewith. |
| **2.** | Occupational Safety and Health Act 1994 | | This Act is for securing the safety, health and welfare of persons at work, for protecting others against risks to safety or health in connection with the activities of persons at work. |
| **3.** | Promotion of Investments Act 1986 | Ministry of International Trade and Industry (MITI) | These Acts cover investments in the manufacturing, agriculture, tourism (including |

[8] Machinery and Equipment Manufacturers Association of Malaysia (MEMA). (2018, March 12) Retrieved from http://www.mema.org.my/aboutus.html

| | | | |
|---|---|---|---|
| | | | hotel) and approved services sectors as well as R&D, training and environmental protection activities. The direct tax incentives grant partial or total relief from income tax payment for a specified period, while indirect tax incentives are in the form of exemptions from import duty, sales tax and excise duty. |
| **4.** | Industrial Coordination Act 1975 | Malaysian Investment Development Authority (MIDA) | An Act to provide for the co-ordination and orderly development of manufacturing activities in Malaysia, for the establishment of an Industrial Advisory Council and for other matters connected therewith or incidental thereto. |
| **5.** | Environmental Quality Act 1974 | Department of Environment (DOE) | This Act is for the prevention, abatement, control of pollution and enhancement of the environment, and for purposes connected therewith. |

### 2.5.2 Government Policies and Initiatives

The Government has identified the M&E industry to be one of the key areas for growth and development. The growth will focus on the manufacture of high value-added and high technology M&E[9].

This industry is categorised into the following classifications: -

a. Power generating machinery and equipment
b. Metalworking machinery
c. Specialised process machinery or equipment for specific industry
d. General industrial machinery & equipment, components and parts[10].

For the further development of the M&E industry, six strategic thrusts have been set during the Third Industrial Master Plan (IMP3), 2006 - 2020 period: -

a. Promoting Malaysia as a regional production, trading and distribution centre for machinery and equipment
b. Intensifying the development and promotion of selected specialised and high technology machinery and equipment
c. Strengthening the engineering support industries and support services
d. Developing Malaysian Standards for machinery and equipment
e. Developing sufficient highly skilled workforce
f. Strengthening the institutional support for the further development of the industry

To enhance growth and encourage investments in the M&E sector, the Government offers the following: -

a. Tax incentives:
    i. Pioneer Status with tax exemption of 70% to 100% of statutory income for a period of 5 to 10 years, or
    ii. Investment Tax Allowance of 60% to 100% on qualifying capital expenditure incurred within a period of 5 years. This allowance can be offset against 70% to 100% of the statutory income for each year of assessment.

[9] Unit Perancang Ekonomi. (2018, March 15). Retrieved from http://epu.gov.my/en/rmk/eleventh-malaysia-plan-2016-2020
[10] Ministry of International Trade and Industry (MITI). (2018, March 15). Retrieved from http://www.miti.gov.my/miti/resources/7._Machinery_and_Equipment_Industry_.pdf

b. Reinvestment Allowance of 60% on qualifying capital expenditure for 15 years.
c. Import duty exemption for machinery and equipment; spare parts and consumables; and raw materials and components.

The future development of the M&E industry in Malaysia will be driven by technological advances, process specialisation and customer requirements for shorter throughput times, faster delivery and lower costs. For the development of the M&E industry, Malaysia will focus on core activities such as R&D, D&D, software development, system integration, assembly, testing and calibration and also focus on quality of production.

The manufacturing of parts & components, and modules which are more capital-intensive will need to be outsourced to keep costs low. Increases in demand and costs of production will necessitate further outsourcing of assembly, and testing & calibration operations by original equipment manufacturer (OEM) companies. M&E manufacturers are also encouraged to increase outsourcing for parts and components from Malaysian engineering companies.

Promotion activities will focus on high technology, high value-added and specialised M&E in the oil and gas exploration, production and processing industries. Promotional efforts are being undertaken to attract companies producing M&E for the photovoltaic and medical industries as well as metalworking and plastic injection machinery.

## 2.6 Industry and Market Intelligence

Industry and market intelligence is the collection and distribution of data of a sector by using a variety of approaches. The sector will be able to utilise this information to make business decisions, manpower developments and training requirements. Industry intelligence is critical for developing strategies in the areas of manpower development and the impact of those developments.

### 2.6.1 Current Machinery & Equipment Industry Outlook in Malaysia

Designated a catalytic sub-sector under the 11MP, M&E is to focus on high technology and high value add production. Meanwhile, it will continue to develop its core activities such as research and development (R&D), design and development (D&D), software development, system integration, assembly, testing and calibration. The M&E industry is also moving towards Industry 4.0 where opportunities lie in specialised modules and machinery for smart factories[11].

### 2.6.2 The Relevancy of Industry 4.0 to M&E Maintenance Efficiency

Industrial production was transformed by steam power in the nineteenth century, electricity in the early twentieth century, and automation in the 1970s. These waves of technological advancement did not reduce overall employment. With the surge of automation in manufacturing sector, the number of manufacturing jobs decreased but new jobs emerged and the demand for new skills increased. Today, another workforce transformation is on the horizon as manufacturing experiences a fourth wave of technological advancement: the rise of new digital industrial technologies that are collectively known as Industry 4.0.

The Ministry of International Trade and Industry (MITI) has identified the main pillars[12] of Industry 4.0 and the description[13] of each is given as in the table below.

[11] Economic Planning Unit (EPU), JPM. (2015). Eleventh Malaysia Plan, 2016-2020. Percetakan Nasional Malaysia Berhad.
[12] MITI. Industry 4.0. FAQ. www.miti.gov.my
[13] Vaidyaa, S., Ambadb, P., Bhoslec, S. (2018). Industry 4.0 – A Glimpse. 2nd International Conference on Materials Manufacturing and Design Engineering. Elsevier B.V.

Table 2.5: The 9 Pillars of Industry 4.0's Pillars Acknowledged by MITI

| No. | I.R4.0 Pillars | Brief Description |
|---|---|---|
| 1 | Autonomous Robots | Coordinated and automated actions of robots to complete tasks intelligently, with minimal human input. |
| 2 | Big Data Analytics | The analysis of ever larger volumes of data. Circulation, collection, and analysis of information is a necessity because it supports productivity growth based on a real-time decision-making process. |
| 3 | Cloud Computing | Storing and accessing data and programs over the Internet instead of your computer's hard drive. |
| 4 | Internet of Things (IOT) | All machines and systems connected to the production plant (as well as other systems) must be able to collect, exchange and save these massive volumes of information, in a completely autonomous way and without the need of human intervention. |
| 5 | Additive Manufacturing (3D printing) | Use in prototyping, design iteration and small-scale production and often described as "rapid prototyping" - produce the desired components faster, more flexibly and more precisely than ever before. |
| 6 | System Integration | The process of linking together different computing systems and software applications physically or functionally to act as a coordinated whole via Internet of Things-IoT. |
| 7 | Cyber-security | With the increased connectivity and use of standard communications protocols, the need to protect critical industrial systems and manufacturing lines from cybersecurity threats is increasing. |
| 8 | Augmented Reality | Augmented-reality-based systems support a variety of services, such as selecting parts in a warehouse and sending repair instructions over |

| No. | I.R4.0 Pillars | Brief Description |
|---|---|---|
| | | mobile devices - provide workers with real-time information to improve decision making and work procedures. |
| 9 | Simulation | Simulations will leverage real-time data to mirror the physical world in a virtual model, which can include machines, products, and humans. This allows operators to test and optimize the machine settings for the next product in line in the virtual world before the physical changeover, thereby driving down machine setup times and increasing quality. |

The figure below illustrates how maintenance operation is handled through interconnection of system.

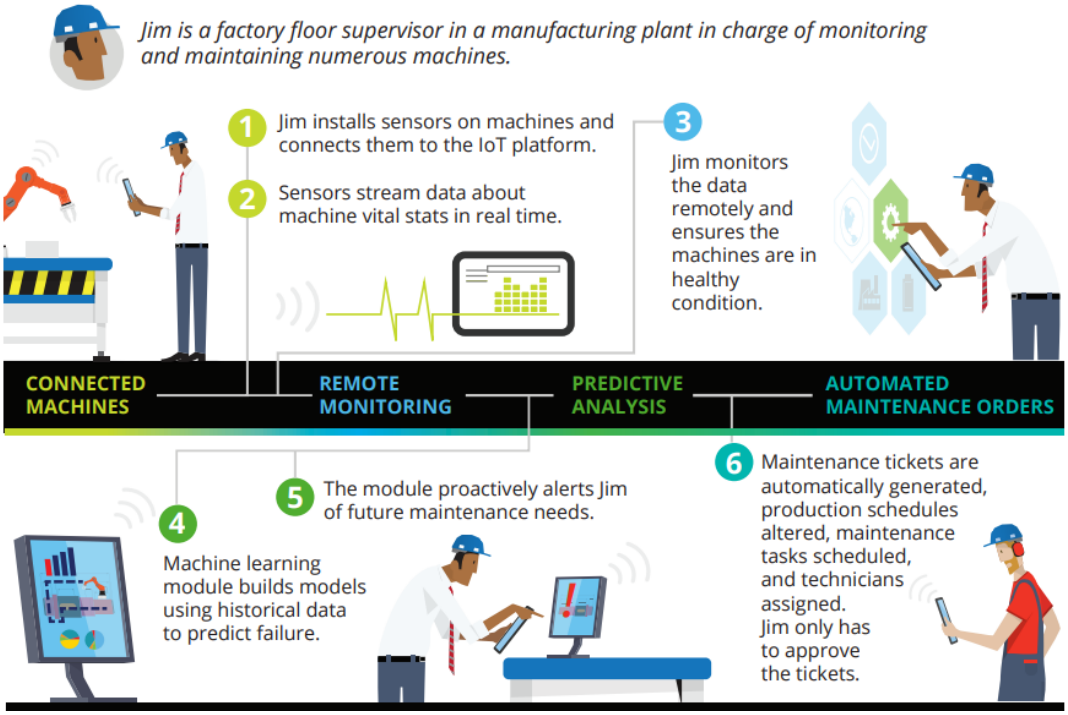


Figure 2.1: The Predictive Maintenance Process in the era of Industry 4.0 (Source: 2017, Deloitte Analysis, Deloitte University Press)

Traditionally, most maintenance professionals have combined many techniques, both quantitative and qualitative, in an effort to identify failure modes and mitigate downtime in manufacturing facilities. But the rise of new connected technologies can enable machines to do these tasks for them, both maximizing the useful life of machine components while still avoiding machine failure.

High value M&E are typically technology intensive, expensive and reliability critical requiring continuous maintenance throughout their life cycle. Continuous maintenance is an engineering service that allows products to achieve required performance through-life with optimum through-life cost. Examples of the high value products include high-tech machine tools, aircraft engine, nuclear power station, train, defence equipment, high-end car, medical equipment, and wind turbine. In addition, manufacturers are looking for opportunities to provide the maintenance service within the in-service phase of the product life cycle to generate additional revenue and profit. Customers and end users are expecting to pay for the usage of the product rather than the full ownership. This is known

as ‘servitisation’ trend within the manufacturing sector[14].

When manufacturers provide continuous maintenance for a product they have developed, especially within an industrial product-service system context, it provides additional opportunities to improve the design and production of those products using the in-service feedback. This can lead to overall reduction of the through-life cost together with reduction in material consumption. There are also new challenges in the area of maintenance service due to the new context[15]. This new development has become the driving factors for continuous maintenance:

a. Engineering for life and extending life of the legacy high value products with optimum cost [16].
b. Better understanding of the foundations of product in-service degradation.
c. Applying new technologies to improve efficiency and effectiveness of the maintenance: large scale data analytics (or Big Data), automation and autonomy.
d. Applying advanced repair and retrofit technologies for legacy systems.
e. Functional improvement of a high value product over time.

With technological developments such as Additive Layer Manufacturing (ALM), Industry 4.0 and Internet of Things (IoT) there is a paradigm shift in our ability to better repair or replace individual components, better understand the health of a product and plan maintenance based on the availability of significantly large volume of data. The increasing amount of data collected requires the development of new product-service business models. Whether the collected data belongs to the manufacturer or the customer/user of equipment is a critical issue to be solved when designing the product-service business models. Manufacturers could pay customers for providing the usage data, because with the data the manufacturer improves product quality by feeding back retrieved information in the product development process following the example of “Total

[14] Roy, R., Erkoyuncu, J., Shaw, A. (2013). The Future of Maintenance for Industrial Product-Service Systems H. Meier (Ed.), Product-Service Integration for Sustainable Solutions, Springer Berlin Heidelberg, pp. 1-15
[15] Colledani, M., Tolio, T., Fischer, A., Iung, B., Lanza, G., Schmitt, R. et al. (2014). Design and Management of Manufacturing Systems for Production Quality CIRP Annals – Manufacturing Technology, 63, pp. 773-796
[16] Arnaiz, A., Revilla, O., Saccani, N. (2014). Extending Manufacturing Towards Service-oriented Business Models: The T-REX Technological Levers that Support This Extension Proc. 3rd Int. Bus. Servitization Conf. Nov. 2014, Bilbao, Spain

Cost of Ownership (TCO)" contracts. The data collection could improve the quality of service received by the customer (as "serviceability") and implement autonomous maintenance approach to reduce the through-life cost of the equipment and increase the customer satisfaction [17].

Further studies on Industry 4.0 and its relationship with this sector will be elaborated in Chapter 4: Findings. The element in questionnaire has set of question regarding Industry 4.0.

### 2.6.3 M&E Industry Economic Scenario

The Machinery & Equipment (M&E) sector is one of the key drivers for Malaysia's success, due to its critical cross-cutting linkages with various economic segments that depend on its products to function. From the mechanisation era (Industry 1.0), M&E has ushered in mass production (Industry 2.0), industrial automation (Industry 3.0), and the advent of IoT-enabled products (Industry 4.0), which is becoming an integral part of modern manufacturing.

The Government has been encouraging local players to keep pace with advanced technologies and be prepared to support the requirements of cross-sector manufacturing in the future. The M&E industry has also been identified as one of the 11MP's '3+2' catalytic and high-potential growth sectors.

In 2016, approval was given to 88 M&E projects providing employment for an estimated 2,866 people, leading to investments worth RM1.5 billion. Of these, 42 were new projects, with investments totalling RM819.4 million (53.3%), while 46 were expansion/diversification projects, involving investments of RM716.7 million (46.7%). The majority of investments (65.1% or RM999.7million) came from domestic sources.

The general industrial M&E, modules, components and parts subsector was the biggest contributor of investments in 2016. A total of 47 projects with investments of RM910.2 million were approved, comprising 21 new projects with investments of RM469.9 million (51.6%) and 26 expansion/diversification projects with investments totalling RM440.3 million (48.4%). Domestic

[17] Datta, P.P., Roy, R. (2010). Cost Modelling Techniques for Availability Type Service Support Contracts: A Literature Review and Empirical Study CIRP Journal of Manufacturing Science and Technology, 3 (2010), pp. 142-157

investments in this subsector amounted to RM585.7 million (64.3%).

The specialised M&E for specific industries subsector attracted investments amounting to RM547.5 million in 32 projects, of which 15 were new projects with RM274.2 million (50.1%). Investments in this subsector were mainly driven by domestic parties, amounting to RM385.5 million (70.4%). Among the significant projects approved was an expansion project by a wholly owned foreign company, investing RM70 million to manufacture die-sorting machines embedded with M2M connectivity and predictive analysis capability for the semiconductor industry. Another approved investment is a diversification project from a home-grown automation champion, with investments amounting to RM17.7 million to manufacture test solutions equipment for smart devices in southern Peninsula Malaysia [18].

[18] MIDA. (2016). Annual Report 2016: Gearing for Strategic Growth

## 2.7 Existing National Occupational Skills Standards (NOSS) Relevant to The MSIC Section C, Division 33

The DSD has developed 58 NOSS related to Division 33, Repair and Installation of Machinery & Equipment as of January 2018. The summary of NOSS title is provided in the table below.

Table 2.6: Summary of NOSS developed under the Division 33
(*Source: NOSS Registry Jan 2018*)

| MSIC Group | Corresponding NOSS/ Level |
|---|---|
| **331 Repair of fabricated metal products, machinery and equipment** | 1. ME-020-5:2012 HVAC Installation & Maintenance Operation Management<br>2. ME-020-4:2012 HVAC Installation & Maintenance Operation Implementation and Administration<br>3. ME-020-3:2012 HVAC Installation & Maintenance Operation Supervision<br>4. ME-020-2:2012 HVAC Installation & Maintenance Operation |
| | 5. F432-003-3:2017 ACMV Installation & Maintenance Operation Supervision<br>6. F432-003-2:2017 ACMV Installation & Maintenance Operation |
| | 7. C331-002-3:2017 Palm Oil Milling Mechanical Maintenance<br>8. C331-002-2:2017 Palm Oil Milling Mechanical Maintenance |
| | 9. C331-003-3:2017 Water Treatment Facility Supervision<br>10. C331-003-2:2017 Water Treatment Facility Maintenance |
| | 11. DS-011-3 Senior Armourer<br>12. DS-011-2 Armourer |
| | 13. MC-011-3 Watch Maker<br>14. MC-011-2 Watch Technician |
| | 15. C331-004-3:2017 Agricultural Machinery and Equipment Maintenance & Repair |
| | 16. C331-001-3:2017 Fibreglass Boat Hull & Superstructure Maintenance Supervision<br>17. C331-001-2:2017 Fibreglass Boat Hull & Superstructure Maintenance Operation |
| | 18. TP-021-5:2012 Marine Mechanical Operation &Maintenance Management<br>19. TP-021-4:2012 Marine Mechanical Operation & Maintenance Administration<br>20. TP-021-3:2013 Marine Mechanical Maintenance |
| | 21. TP-023-5:2012 Marine Electronics Operation &Maintenance Management<br>22. TP-023-4:2012 Marine Electronics Operation, Maintenance & Administration<br>23. TP-023-3:2013 Ship Electronics Maintenance |
| | 24. TP-020-5:2012 Marine Electrical Operation & Maintenance Management<br>25. TP-020-4:2012 Marine Electrical Operation & Maintenance Administration<br>26. TP-020-3:2013 Ship Electrical Maintenance |
| | 27. TP-090-5 Second Engineer Officer Of 3000kw or More on |

| MSIC Group | Corresponding NOSS/ Level |
|---|---|
| **331 Repair of fabricated metal products, machinery and equipment** | Near Coastal Trade Voyage<br>28. TP-090-4 Watch Keeping Engineer Of 750kw or More on Near Coastal Trade Voyage<br>29. H501-002-3:2017 Marine Engine Maintenance Operation<br>30. H501-002-2:2017 Marine Engine Room Watchkeeping |
| | 31. H491-002-5:2017 Rolling Stock Maintenance Management<br>32. H491-002-4:2017 Rolling Stock Maintenance Planning and Controlling<br>33. H491-002-3:2017 Rolling Stock Maintenance Quality Control<br>34. H491-002-2:2017 Rolling Stock Maintenance |
| | 35. TP-060-5:2013 Aircraft Maintenance Operation and Certification<br>36. TP-060-4:2013 Aircraft Maintenance Operation and Certification (Limited Maintenance Authorization) |
| | 37. TP-071-5 Aircraft Maintenance Engineer Avionics (Electrical)<br>38. TP-072-5 Aircraft Maintenance Engineer Avionics (Instrument)<br>39. TP-070-4 Aircraft Maintenance Technician (Avionics)<br>40. TP-060-3:2013 Aircraft Maintenance Operation (Non-Certifying) |
| | 41. TP-076-3:2012 Aircraft Structure Repair-Composite<br>42. TP-073-3:2012 Aircraft Structure Repair-Sheet Metal |
| | 43. TP-074-3:2012 Aviation Welding<br>44. TP-074-2:2012 Aviation Welding<br>45. TP-074-1:2012 Aviation Welding |
| **332 Installation of industrial machinery and equipment** | Nil. Most NOSS combining the competency of installation together with maintenance, repair and overhaul. |

## 2.8 Chapter Conclusion

The Machinery and Equipment (M&E) sector has been identified as one of the catalytic sub-sectors under the 11th Malaysia Plan due to its cross-cutting linkages with all economic segments such as the primary, manufacturing and services sectors. The growth will focus on the manufacturing of high value added and high technology M&E.

Currently, there is not much data or statistics for economic activities of repair and installation of M&E that can be collected. The existing studies and available data are mostly on manufacturing of M&E.

Based on the classification of MSIC, this industry division covers wide spectrum of activities related to repair works and smaller scope of installation works. Some of installation works are covered in construction industry.

Several key stakeholders from government agencies which directly involved in the development and monitoring of the industry in terms of compliance to the relevant acts and regulations. The only industry association is Machinery and Equipment Manufacturers Association of Malaysia (MEMA).

There are 45 NOSS related to this division have been developed over the years. Certain NOSS titles in this group have not been revised and require immediate action to update the Standard.

The findings on industry landscape, MSIC definition of the job area, and the NOSS that have been developed give an insight of the overall picture of the industry. These inputs pave the way and guide the next course of action in restructuring the occupational structure, identifying skills in demand and critical job titles. The requirements of Industry 4.0 as well would give an impact to the future of the manpower in this area.

As to materialise the above, certain research methodologies will be employed. The description of research strategies and approaches in discussed in next chapter.

# CHAPTER 3: METHODOLOGY

## 3.1 Chapter Introduction

This section gives an overview of the strategies for data collection and potential analyses to be performed to meet the deliverables.

## 3.2 Research Methodology

In this study, qualitative analysis was selected as the main method of obtaining and analysing the necessary input in view of the Electronics Products Manufacturing industry's Occupational Framework and the types and sources of information required to develop the occupational framework.

Qualitative analysis was selected as the method of research because of the following:

a. It investigates not only the what, where and when, but also the why and how of the decision-making process;
b. It requires smaller but more focused samples; and
c. It focuses on unique themes that illustrate the range of the meanings of the subject matter rather than the statistical significance of the occurrence.

This process uses inductive reasoning, by which themes and categories emerge from the data through the researcher's careful examination and constant comparison. This study uses a combination of the following methods to gather information:

a. Document analysis;
b. Semi-structured interviews;
c. Industry Site observation, and
d. Focus Group Discussion (FGD) workshops.

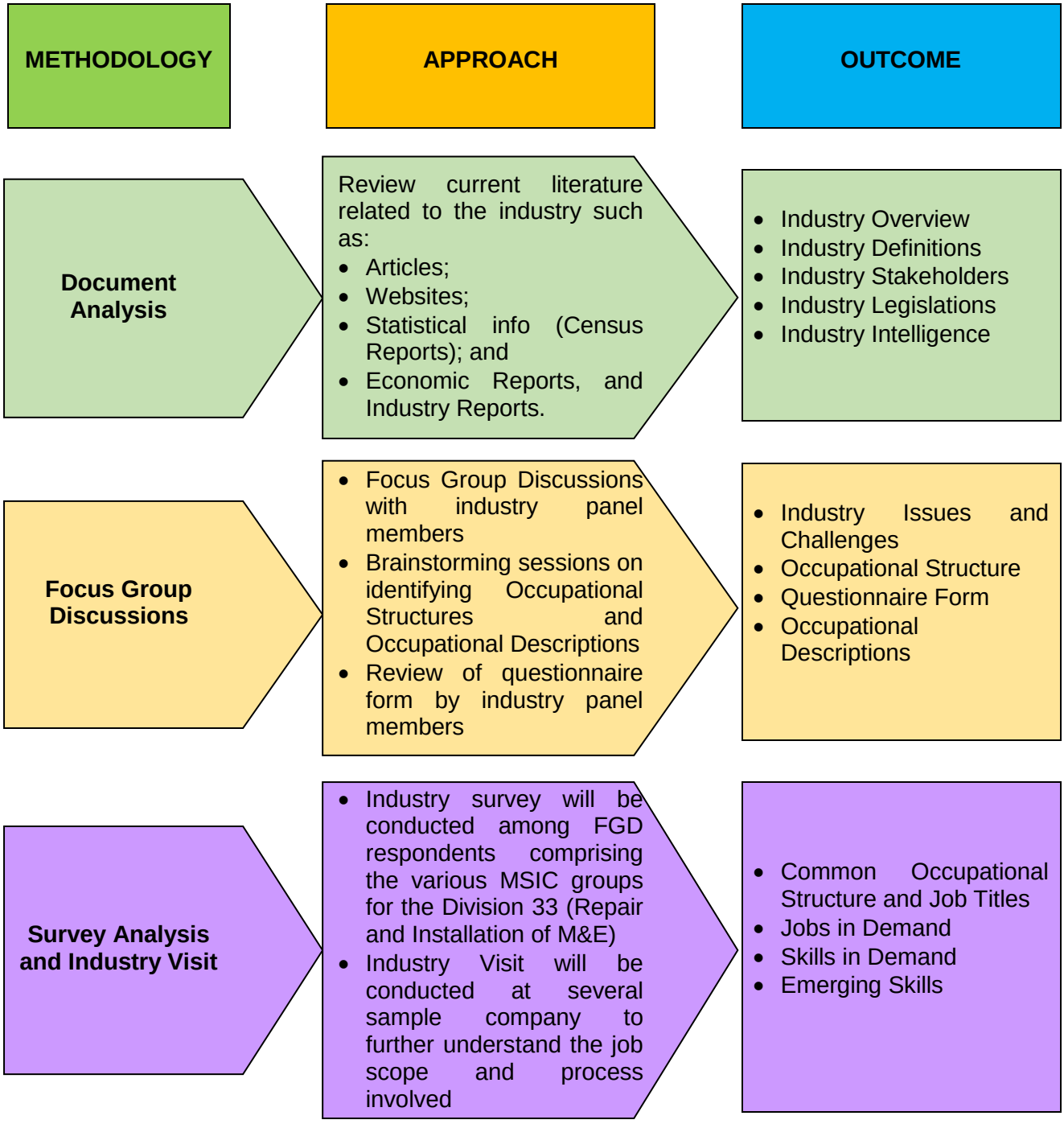


Figure 3.1: Operational Framework of Research

Below are the OF development phases for the Division 33: Repair and Installation of M&E.

### 3.2.1 Phase 1: Inception

#### a. Document Analysis

Document analysis or literature review was done in the Inception Phase to obtain an overview of the industry in terms of Industry Definition, Stakeholders, Acts and Industry Intelligence.

In this process, pertinent and relevant information published by the government, regulatory and professional bodies, news agencies, research agencies and any other sources relevant to the background information of the industry were reviewed and analysed. Most information obtained was mainly on the manufacturing of M&E.

Details of the sources for the documents reviewed can be referred in the Reference section of this report, but generally the documents referred during the document analysis phase were as follows:

i. Eleventh Malaysia Plan 2016-2020
ii. Institute for Labour Market Information and Analysis (ILMIA) Report 2016/2017
iii. MITI Annual Report 2016
iv. MIDA Annual Report 2016
v. Department of Statistics, Economic Census Report 2016
vi. Department of Statistics, data on Employment and Industry Productivity
vii. NOSS Registry May 2018
viii. Malaysian Standard Industrial Classification (MSIC) 2008
ix. Online newspaper/magazine articles
x. Official websites of industry stakeholders and legislations

The outcome of this step is an overall view of the industry as described in Chapter 2 which includes the list of stakeholders (i.e. Regulatory

bodies, related government agencies, industry associations), legislations, policies and initiatives, industry and market intelligence, MSIC scope of section and groups, plus the list of developed NOSS relevant to the Repair & Installation M&E industry.

**b. Industry Engagement / Focus Group Meeting with Development Panel**

The Industry Engagement/Focus Group Discussion (FGD) meeting with the development panel members was conducted to confirm the findings obtained during document analysis with them, review the draft questionnaire form in order to gauge the response of the industry and obtain industry intelligence information such as issues and challenges and use of Industry 4.0. This is due to certain information especially for the industry intelligence section that is not available in the form of available literature.

Facts obtained during the literature review were discussed and presented to the Development Panel members, comprising representatives from various sectors of the industry in focus group workshop sessions for their review and confirmation. The Focus Group Discussion was held on the 28-29 of April 2018.The attendees are listed below:

Table 3.1: List of FGD Participants

| NO. | NAME | EXPERTISE AREA | POSITION & ORGANISATION |
|---|---|---|---|
| 1 | Datuk Mohamad Saleh Bin Ghazali | Plastic Machinery | Managing Director Micromagna Machinery Sdn. Bhd. |
| 2 | Jaafar Bin Baidi | Operation of Machinery & Equipment Sector | Executive Secretary MEMA |
| 3 | Chan Chee Tatt | Human Resources & Technical Training | HR & Technical Training Manager Favelle Favco Cranes (M) Sdn. Bhd. |
| 4 | Gangga Sinaran Maqnikham | Learning & Development | Human Resources Manager Muhibbah Engineering Berhad |

| NO. | NAME | EXPERTISE AREA | POSITION & ORGANISATION |
|---|---|---|---|
| 5 | Andy Ng | Air Compressor | Managing Director Carling Air Compressor Sdn Bhd |
| 6 | Ir. A.K. Woo | Engineering Services | Managing Director Master Jaya Engineering Sdn. Bhd. |
| 7 | Osman Bin Hj Isa | Industrial Analysis & Processing | Section Head Industrial Analysis & Processing DOSH |
| 8 | Mohd Syarafi Bin Rohseli | Engineering Services | Operation Manager Ceteau Malaysia Sdn Bhd |
| 9 | Michael Maniyarasu Sanjeevi | Electrical Engineering | Managing Director Gumi Asli Elektrikal Sdn Bhd |
| 10 | Richard C.F. Ng | Air Compressor | Operation Manager Carling Air Compressor Sdn Bhd |
| 11 | Christopher Raja Selvan | Water Filtering System | Engineer Puncak Enviro Sdn Bhd |
| 12 | Muhammad Fauzan Bin Mat Yusoff | Ship Building & Repair | Senior Engineer Destini Shipbuilding & Engineering Sdn Bhd |

Other than confirming the document analysis findings with the development panel, initial information was also obtained from the Focus Group Discussions such as the Occupational Structures, Skills in Demand and Emerging Skills. The scope of the analysis was centred on the following key areas:

i. Industry background;
ii. Occupational structure; and
iii. Skills in demand.

The Focus Group Discussion members who are also considered as the core development panel members for this research, together with the facilitator have produced the draft survey questionnaire in the first Focus Group Discussion. The survey questionnaire has 4 sections, covering

the key information shown below. The full questionnaire is also attached in Annex 3 for reference.

**Section 1: Competency in Demand**

This section is exploring the competency that is required by the industry. Another objective of this section is trying to figure out the skills gap and how to overcome the gap.

**Section 2: Jobs in Demand**

This section is aimed to determine which category of workers that is in shortage supply or over supply, the category is based on MASCO such as skilled workers, semi-skilled workers and low skilled workers.

**Section 3: Emerging Skills**

This section is trying to determine the readiness of industry players and the workers in the advent of IR4.0. The technology drives or pillars of IR4.0 is listed and the respondents have to decide the relevancy of each elements in their line of duty.

**Section 4: Related Issues**

This section is exploring the common issues surrounding the industry. The respondents are asked to suggest ways of overcoming those issues.

In the process of gathering the input, DACUM brainstorming technique was adopted and were attended by development panel members who discussed the different sub-sectors and areas. Facts obtained during the literature review were also discussed and presented to the development panel members. The information gathered was then used as input to the Occupational Framework of the said sub-sector. Workshops and interviews were conducted during the development of the Machinery & Equipment Sector Occupational Framework. Follow up discussions with the expert panel members were done in smaller groups to verify the findings of the Occupational Framework. The details of the workshops are listed below:

Table 3.2: List of Occupational Framework Development Session

| Date | Venue | Activity |
|---|---|---|
| **28 – 29 April 2018** | Majestic II, Palace of the Golden Horses Hotel | • Confirmation of Preliminary Literature Search<br>• Identification of Occupational Structure |
| **14 – 15 July 2018** | Palace of the Golden Horses Hotel | • Confirmation of Preliminary Literature Search<br>• Confirmation of Occupational Structure<br>• Development of Job Description |

In the next phase, the occupational descriptions are developed with the development panel, and the jobs in demand, skills in demand and emerging skills are to be confirmed via the industry survey.

**c. Validation of the Literature Review and Questionnaire by Review Panel**

The draft report and survey questionnaire were reviewed and validated by the Review Panel comprising industry representatives.

### 3.2.2 Phase 2: Interim

**a. Interview Surveys**

Interview surveys will be conducted concurrently during the industry survey, where the survey respondents will comprise of those from all job areas under the MSIC Division 33. The interviews will try to obtain a 'house view' which means the agreed upon response for the organisation. That is why the target group for the survey is the organisation's Human Resource or higher management representatives. These interviews aim to obtain information on the common occupational structures used in various organisations, their job scopes, skills gap and emerging skills required. The actual number of interview respondents is targeted to be from each MSIC group which are 2 main areas of repair

and installation of M&E. The targeted number of industry survey respondents are 30 companies.

Table 3.3: Number of Targeted Respondents According to MSIC Group

| MSIC SECTION | C | MANUFACTURING | NUMBER OF TARGETED RESPONDENTS |
|---|---|---|---|
| **MSIC DIVISION** | **33** | Repair and Installation of Machinery and Equipment | |
| **MSIC GROUP** | **331** | Repair of fabricated metal products, machinery and equipment | **25** |
| | **332** | Installation of industrial machinery and equipment | **5** |

**b. Qualitative Data Analysis**

The findings from these interviews will be tabulated and presented in Chapter 4 of this report as Occupational Structure, Skills in Demand, Jobs in Demand and Emerging Skills. The information collected regarding organisation structures will be analysed during the following focus group discussion when determining the Occupational Structure. Thematic reasoning will be used when analysing the data based on the main objectives of research and guided by the research scope.

The analysed findings of the survey are presented to the Development Panel for their review and confirmation. Thereafter, the Development Panel will proceed with the development of the Occupational Structure (OS) and Occupational Description (OD). The technique of OS development is described in section 3.4 while the OD development technique is mentioned in section 3.5 below. All the above information will be presented in the draft OF document according to the format prescribed by JPK.

### 3.2.3 Phase 3: Final

**Review and Handover of Final OF document to Industry Stakeholders**

The final draft of the OF Document is to be presented to the Review Panel at the Occupational Framework Technical Evaluation Committee meeting for their comments and approval before it is to be submitted to JPK. After obtaining approval from JPK, the document will be handed over to industry stakeholders in the final session of the research. The review and final handover session aims to finalise the OF research project by having the final meeting with industry stakeholder representatives to be briefed on the contents and findings of the research.

## 3.3 Chapter Conclusion

This chapter has elaborated on the methodology used in the study which is through literature review, online survey and focus group discussion. The results of the Occupational Structure and Occupational Description development and skills in-demand identified by focus group and sector surveys are presented in the next chapter, Chapter 4: Findings.

# CHAPTER 4: FINDINGS

## 4.1 Chapter Introduction

This chapter elaborates the findings from the research works. The findings revolve around the objectives set for the study namely; to produce Occupational Structure (OS) from data analysis, interviews, site visits and focus group; to determine job descriptions of each job title from the OS; and to investigate the skills in demand in the sector.

## 4.2 Surveys and Questionnaires Analysis

The respondents for the surveys and questionnaires are involving 30 companies, the designation of the respondents ranging from HR executives to senior managers. The results of the surveys and questionnaires are presented below:

### 4.2.1 Section 1: Competency in Demand

This section is exploring the competency that is required by the industry. Another objective of this section is trying to figure out the skills gap and how to overcome the gap.

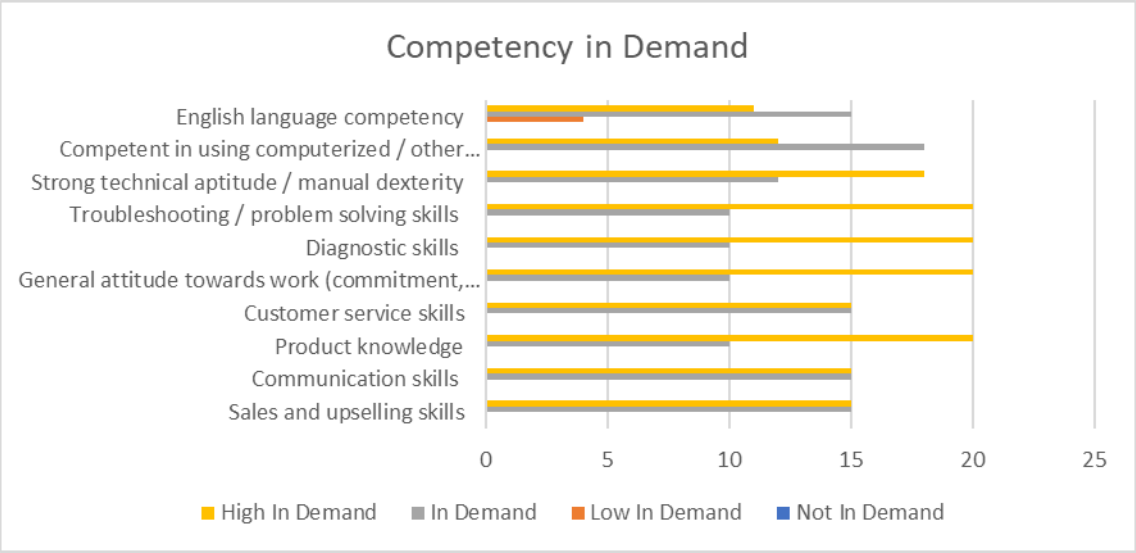


Chart 4.1: Competency in demand

The respondents have explicitly marked the top 5 skills highly demanded by the employer are troubleshooting / problem solving, diagnostic, product knowledge, strong technical aptitude and general attitude towards work.

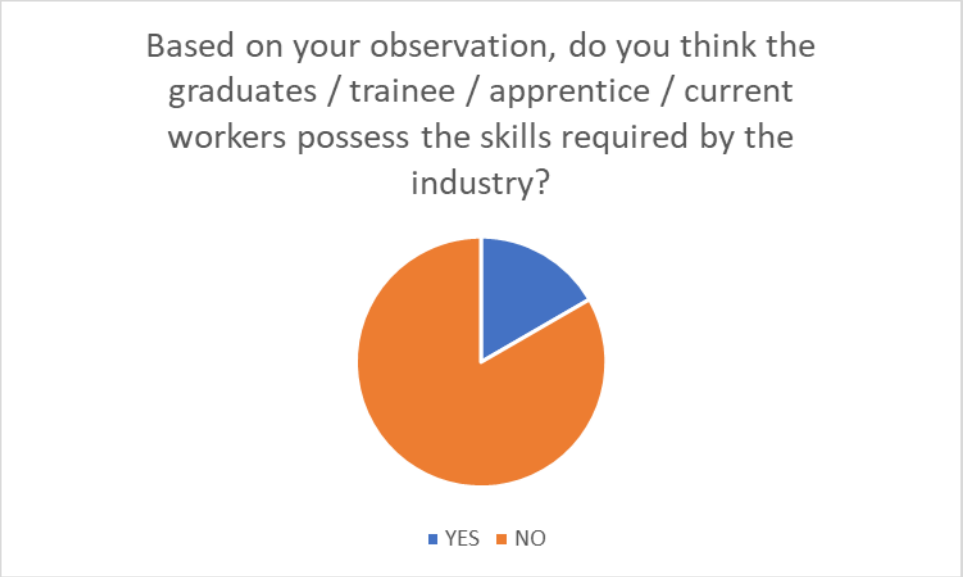


Chart 4.2: Skills mismatch responses

Only 30% of the respondents agreed that the graduates / trainee / apprentice / current workers do not have the required skills by the employers. The reasons for that are shown in the chart below:

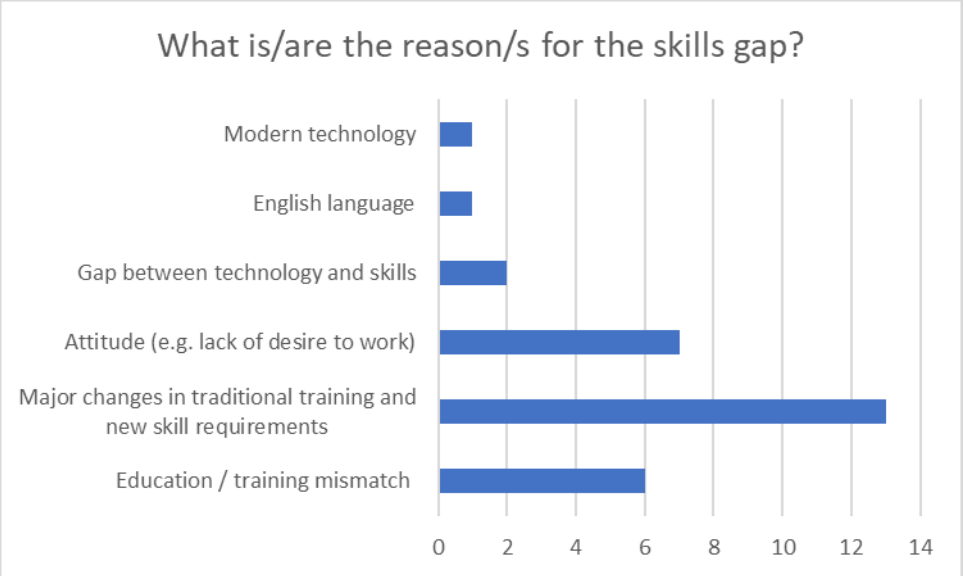


Chart 4.3: Reasons for skills gap

The respondents ranked major changes in traditional training and new skill requirements as the main reason for skills gap and the attitude as the second main contributing factor.

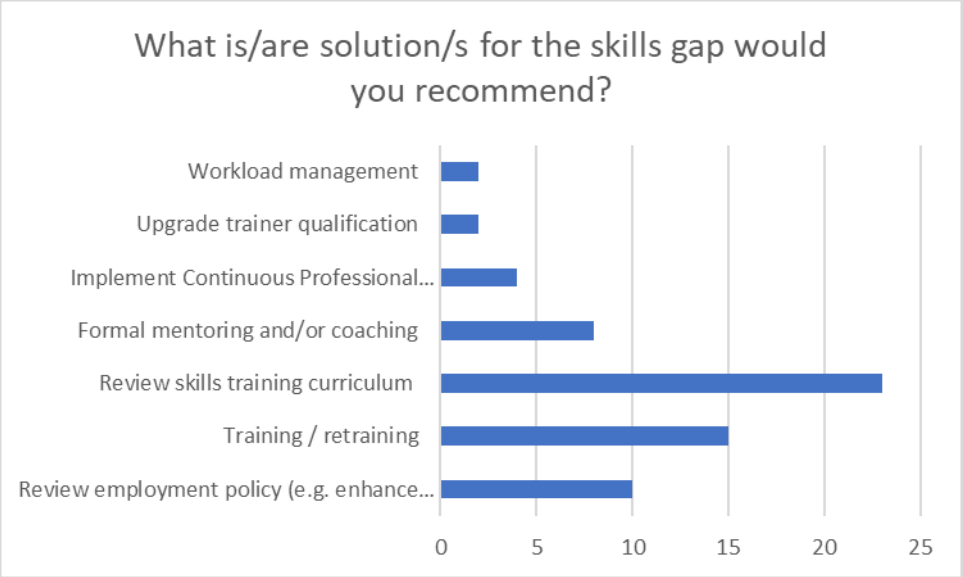


Chart 4.4: Solutions for skills gap

Majority of the respondents suggested that skills training curriculum must be revised and suits the current requirements of the industry.

### 4.2.2 Section 2: Jobs in Demand

This section is aimed to determine which category of workers that is in shortage supply or over supply, the category is based on MASCO such as skilled workers, semi-skilled workers and low skilled workers.

| Category of Skills | Description |
|---|---|
| **Skilled Workers** | Managers, Professionals, Technicians and Associate Professionals |
| **Semi-Skilled Workers** | Clerical Support, Service and Sales, Craft and related Trades Workers and Plant and Machine Operators and Assemblers |
| **Low Skilled Workers** | Elementary Workers |

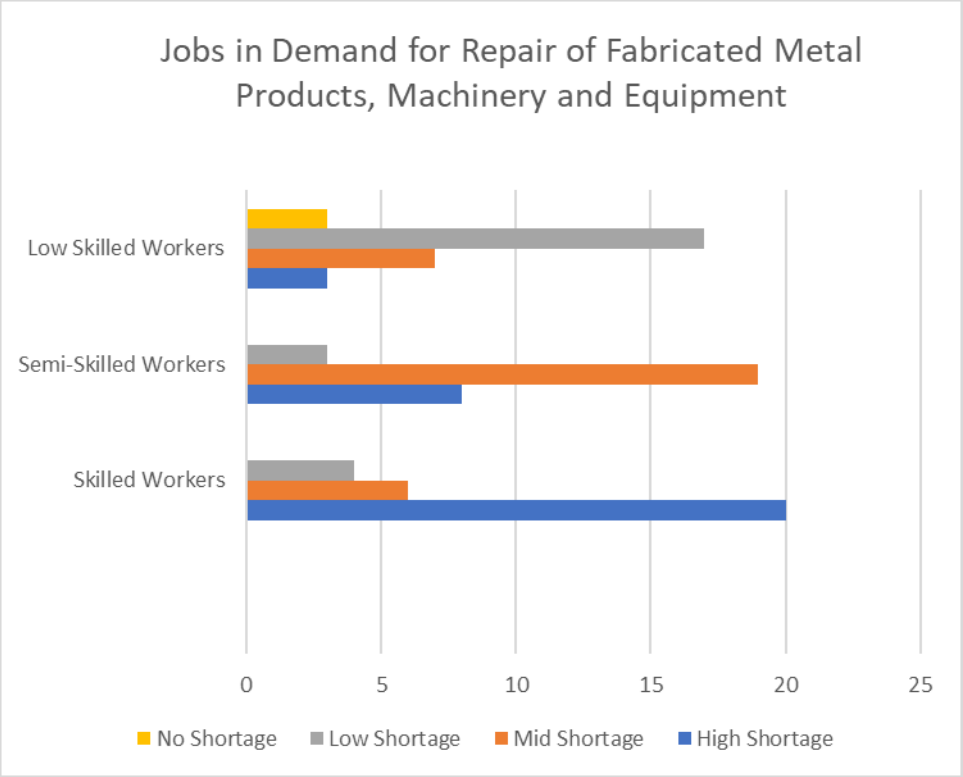


Chart 4.5: Jobs in demand for group 331

The skilled and semi-skilled workers for both groups (331 & 332) are highly in demand as the current manpower supply in short of these two groups of workers. Elementary / low skilled workers are low in demand as there is surplus of foreign workers to fill up the low skilled workers segmentation.

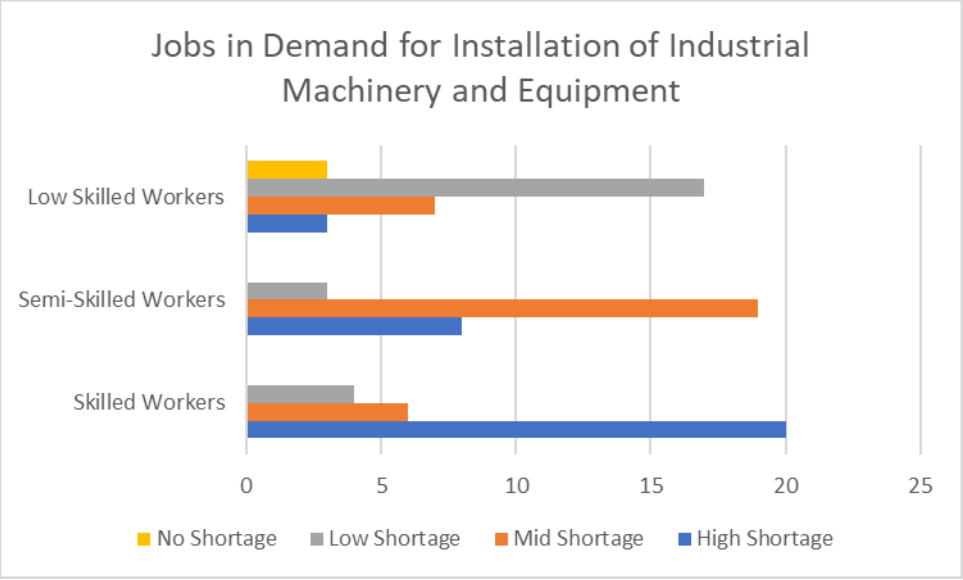


Chart 4.6: Jobs in demand for group 332

### 4.2.3 Section 3: Emerging Skills

This section is trying to determine the readiness of industry players and the workers in the advent of IR4.0. The technology drives or pillars of IR4.0 is listed and the respondents have to decide the relevancy of each elements in their line of duty.

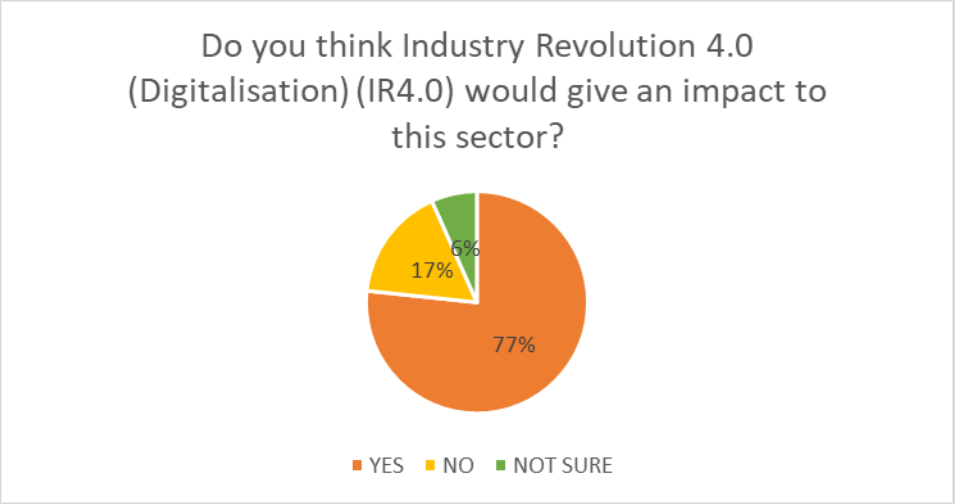


Chart 4.7: Impact of IR40 to the industry

77% of the respondents agreed that IR4.0 would give an impact to this sector. The respondents agreed that all the 9 technology pillars would affect the work of repair and installation of machinery & equipment especially for Level 4 and above as shown in Chart 4.8 below.

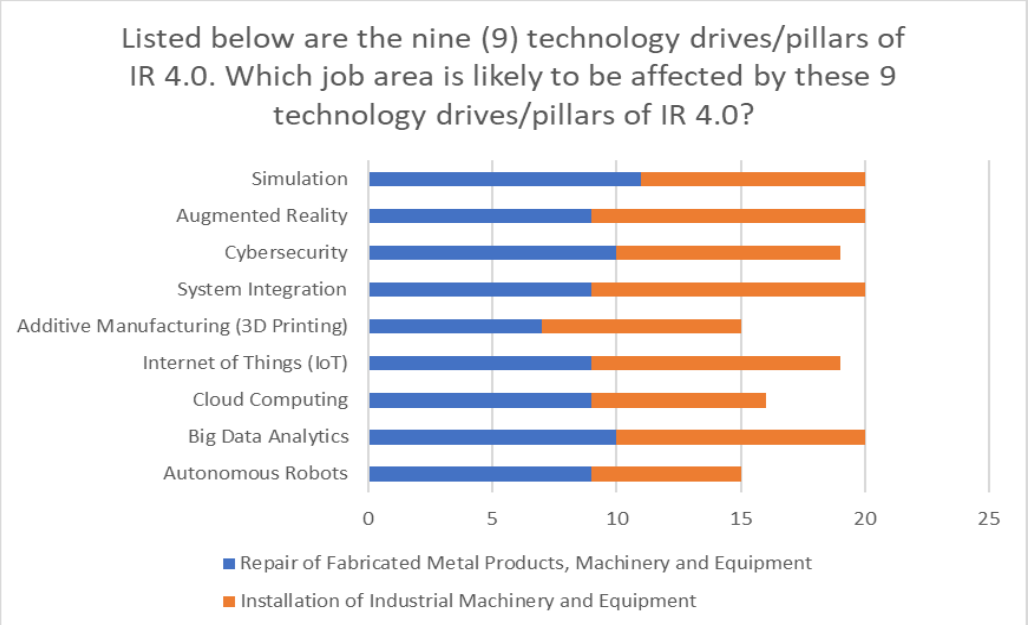


Chart 4.8: The 9 technology drives in relation to the two groups of job area

Table 4.1: The description of important prerequisite and skills for workforce in the age of IR4.0 published in Skill Development for Industry 4.0 Whitepaper by Roland Berger GMBH in 2016

| PREREQUISITE & SKILLS | KNOWLEDGE ABOUT ICT | ABILITY TO WORK WITH DATA | TECHNICAL KNOW-HOW | PERSONAL SKILLS |
|---|---|---|---|---|
| **DETAILS** | ▪ Basic Information Technology knowledge<br>▪ Ability to use and interact with computers and smart machines like robots, tablets etc.<br>▪ Understanding machine to machine communication, IT security & data protection | ▪ Ability to process and analyze data and information obtained from machines<br>▪ Understanding visual data output & making decisions<br>▪ Basic statistical knowledge | ▪ Inter-disciplinary & generic knowledge about technology<br>▪ Specialized knowledge about manufacturing activities and processes in place<br>▪ Technical know-how of machines to carry out maintenance related activities | ▪ Adaptability & ability to change<br>▪ Decision making<br>▪ Working in team<br>▪ Communication skills<br>▪ Mindset change for lifelong learning |

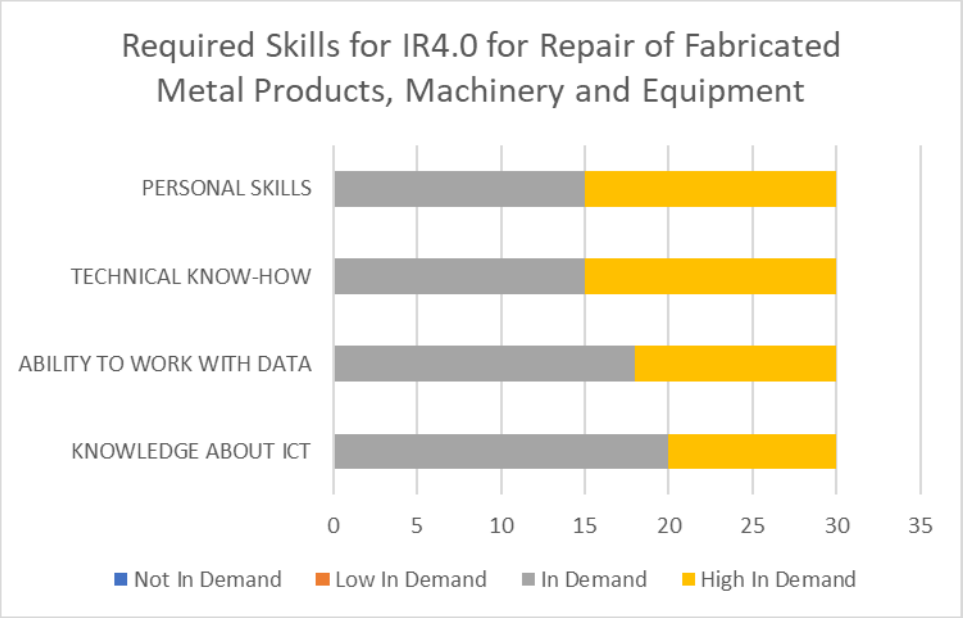


Chart 4.9: Required skills for IR4.0 for group 331

In order to survive in the era of IR4.0, the respondents unanimously ranked personal skills and technical know how as the most important required skills for IR4.0.

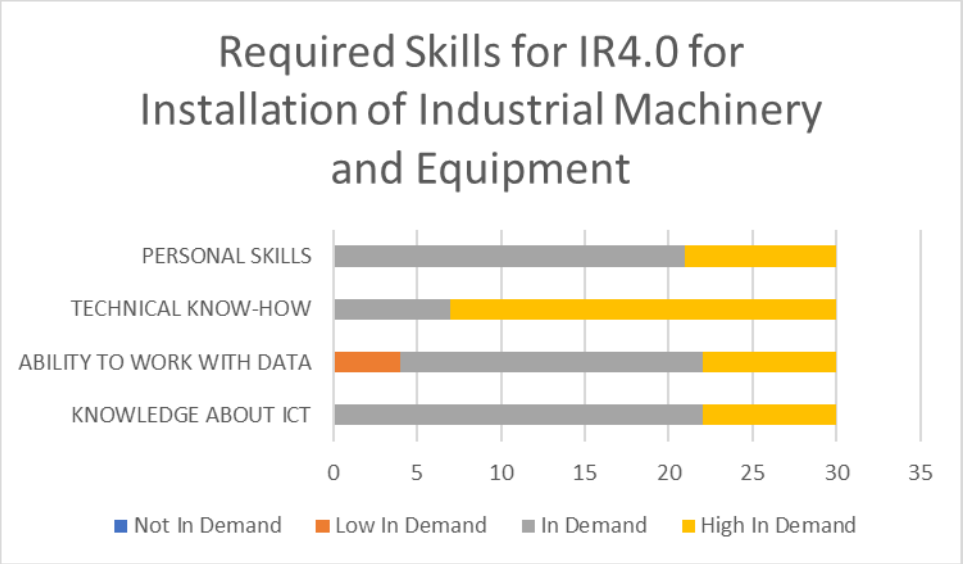


Chart 4.10: Required skills for IR40 for group 332

### 4.2.4 Section 4: Related Issues

This section is exploring the common issues surrounding the industry. The respondents ranked the most relevant issues for the industry.

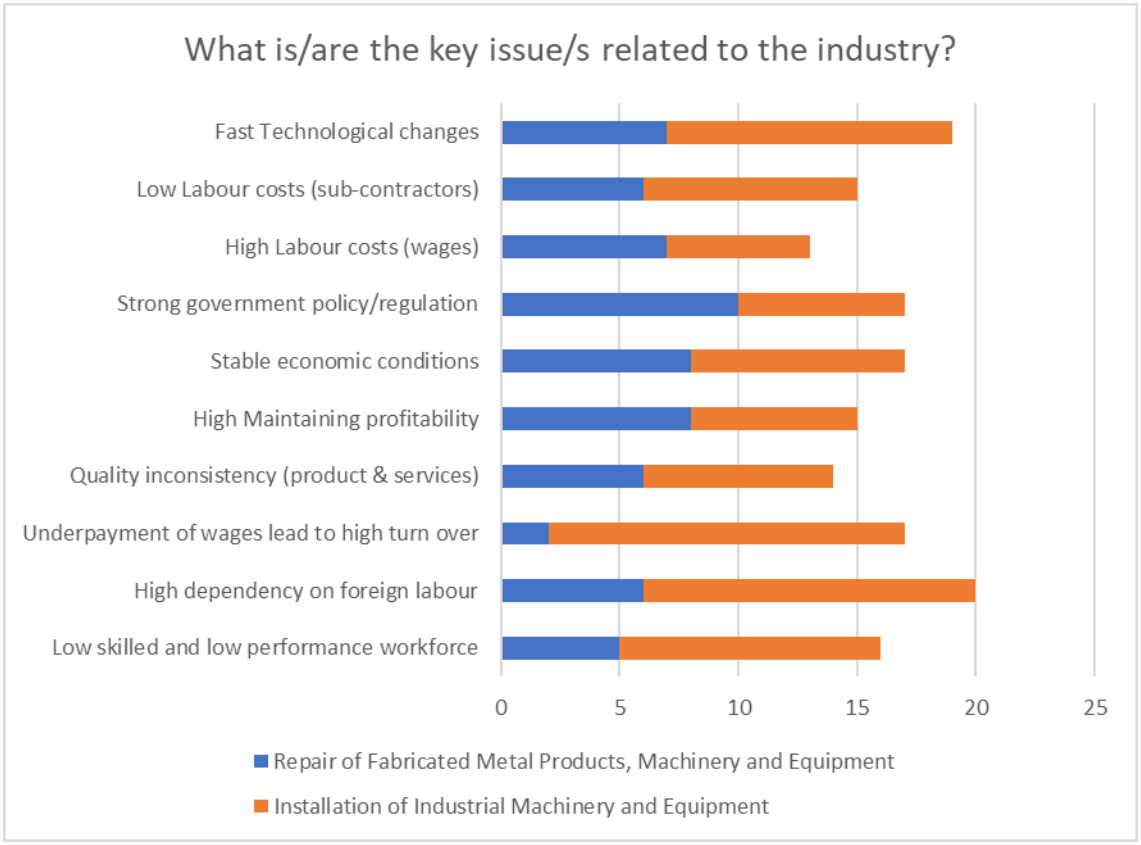


Chart 4.11: List of key issues related to the industry

## 4.3 OCCUPATIONAL STRUCTURE (OS)

Table 4.2: Group 331 Occupational Structure (1 of 9)

| SECTION | (C) MANUFACTURING | | | | | |
|---|---|---|---|---|---|---|
| DIVISION | (33) REPAIR OF MACHINERY AND EQUIPMENT | | | | | |
| GROUP | (331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT | | | | | |
| AREA | REPAIR OF FABRICATED METAL PRODUCTS (HYDRAULIC) | REPAIR OF FABRICATED METAL PRODUCTS (PNEUMATIC) | REPAIR OF FABRICATED METAL PRODUCTS (ELECTRICAL) | REPAIR OF FABRICATED METAL PRODUCTS (ELECTRONIC) | REPAIR OF FABRICATED METAL PRODUCTS (MECHANICAL) | REPAIR OF FABRICATED METAL PRODUCTS (MECHATRONIC) |
| LEVEL 8 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 7 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 6 | Hydraulic System Specialist | Pneumatic System Specialist | Electrical System Specialist* ** | Electronic System Specialist* ** | Mechanical System Specialist* ** | Mechatronic System Specialist* ** |
| LEVEL 5 | Hydraulic Maintenance Engineer | Pneumatic Maintenance Engineer | Electrical Maintenance Engineer* ** | Electronic Maintenance Engineer* ** | Mechanical Maintenance Engineer* ** | Mechatronic Maintenance Engineer* ** |
| LEVEL 4 | Hydraulic Maintenance Assistant Engineer | Pneumatic Maintenance Assistant Engineer | Electrical Maintenance Assistant Engineer* ** | Electronic Maintenance Assistant Engineer* ** | Mechanical Maintenance Assistant Engineer* ** | Mechatronic Maintenance Assistant Engineer* ** |
| LEVEL 3 | Hydraulic Maintenance Supervisor | Pneumatic Maintenance Supervisor | Electrical Maintenance Supervisor* | Electronic Maintenance Supervisor* | Mechanical Maintenance Supervisor* | Mechatronic Maintenance Supervisor* |
| LEVEL 2 | Hydraulic Maintenance Technician | Pneumatic Maintenance Technician | Electrical Maintenance Technician* | Electronic Maintenance Technician* | Mechanical Maintenance Technician* | Mechatronic Maintenance Technician* |
| LEVEL 1 | No Level | No Level | No Level | No Level | No Level | No Level |

Note: *Critical Job Titles
**Jobs relevant to IR 4.0

Table 4.2a: Group 331 Occupational Structure (2 of 9)

| SECTION | (C) MANUFACTURING | | | |
|---|---|---|---|---|
| **DIVISION** | **(33) REPAIR OF MACHINERY AND EQUIPMENT** | | | |
| **GROUP** | **(331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT** | | | |
| **AREA** | **REPAIR OF MACHINERY (ROTARY ENGINE)** | **REPAIR OF MACHINERY (STEAM ENGINE)** | **REPAIR OF MACHINERY (ROTARY VANE ENGINE)** | **REPAIR OF MACHINERY (GAS ENGINE)** |
| **LEVEL 8** | Not Available | Not Available | Not Available | Not Available |
| **LEVEL 7** | Not Available | Not Available | Not Available | Not Available |
| **LEVEL 6** | Rotary Engine Maintenance Specialist | Steam Engine Maintenance Specialist | Rotary Vane Engine Maintenance Specialist | Gas Engine Maintenance Specialist |
| **LEVEL 5** | Rotary Engine Maintenance Engineer | Steam Engine Maintenance Engineer | Rotary Vane Engine Maintenance Engineer | Gas Engine Maintenance Engineer |
| **LEVEL 4** | Rotary Engine Maintenance Assistant Engineer | Steam Engine Maintenance Assistant Engineer | Rotary Vane Engine Maintenance Assistant Engineer | Gas Engine Maintenance Assistant Engineer |
| **LEVEL 3** | Rotary Engine Maintenance Supervisor | Steam Engine Maintenance Supervisor | Rotary Vane Engine Maintenance Supervisor | Gas Engine Maintenance Supervisor |
| **LEVEL 2** | Rotary Engine Maintenance Technician | Steam Engine Maintenance Technician | Rotary Vane Engine Maintenance Technician | Gas Engine Maintenance Technician |
| **LEVEL 1** | No Level | No Level | No Level | No Level |

Table 4.2b: Group 331 Occupational Structure (3 of 9)

| SECTION | (C) MANUFACTURING | | | | | |
|---|---|---|---|---|---|---|
| **DIVISION** | **(33) REPAIR OF MACHINERY AND EQUIPMENT** | | | | | |
| **GROUP** | **(331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT** | | | | | |
| **AREA** | **REPAIR OF (HEATING, VENTILATION, AIR CONDITIONING - HVAC)** | **REPAIR OF (AIR-CONDITIONING AND MECHANICAL VENTILATION -ACMV)** | **REPAIR OF MACHINERY (PLANTS & MILLS)** | **REPAIR OF MACHINERY (WATER TREATMENT)** | **REPAIR OF MACHINERY (WEAPON TECHNOLOGY & MANAGEMENT)** | **REPAIR OF MACHINERY (AMMUNITION & EXPLOSIVE MANAGEMENT)** |
| **LEVEL 8** | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| **LEVEL 7** | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| **LEVEL 6** | Not Available | Not Available | Plants & Mills Machinery Maintenance Specialist | Water Treatment Machinery Maintenance Specialist | Not Available | Not Available |
| **LEVEL 5** | HVAC Installation & Maintenance Operation Engineer | ACMV Installation & Maintenance Operation Engineer | Plants & Mills Machinery Maintenance Engineer | Water Treatment Machinery Maintenance Engineer | Senior Armament Officer | Ammo & Explosive Senior Executive |
| **LEVEL 4** | HVAC Installation & Maintenance Operation Assistant Engineer | ACMV Installation & Maintenance Operation Assistant Engineer | Plants & Mills Machinery Maintenance Assistant Engineer | Water Treatment Machinery Maintenance Assistant Engineer | Armament Officer | Ammo & Explosive Executive |
| **LEVEL 3** | HVAC Installation & Maintenance Operation Supervisor | ACMV Installation & Maintenance Operation Supervisor | Plants & Mills Machinery Maintenance Operation Supervisor | Water Treatment Machinery Maintenance Operation Supervisor | Senior Armourer | Ammo & Explosive Supervisor |
| **LEVEL 2** | HVAC Installation & Maintenance Operation Technician | ACMV Installation & Maintenance Operation Technician | Plants & Mills Machinery Maintenance Operation Technician | Water Treatment Machinery Maintenance Operation Technician | Armourer | Ammo & Explosive Technician |
| **LEVEL 1** | No Level | No Level | No Level | No Level | No Level | No Level |

Table 4.2c: Group 331 Occupational Structure (4 of 9)

| SECTION | (C) MANUFACTURING | | | |
|---|---|---|---|---|
| DIVISION | (33) REPAIR OF MACHINERY AND EQUIPMENT | | | |
| GROUP | (331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT | | | |
| AREA | REPAIR OF ELECTRONIC AND OPTICAL EQUIPMENT (ELECTRONIC AND OPTICAL EQUIPMENT) | REPAIR AND MAINTENANCE OF THE MEASURING, TESTING, NAVIGATING AND CONTROL EQUIPMENT (AIRCRAFT ENGINE INSTRUMENTS) | REPAIR AND MAINTENANCE OF THE MEASURING, TESTING, NAVIGATING AND CONTROL EQUIPMENT (AUTOMOTIVE EMISSIONS TESTING EQUIPMENT) | REPAIR AND MAINTENANCE OF THE MEASURING, TESTING, NAVIGATING AND CONTROL EQUIPMENT |
| LEVEL 8 | Not Available | Not Available | Not Available | Not Available |
| LEVEL 7 | Not Available | Not Available | Not Available | Not Available |
| LEVEL 6 | Not Available | Not Available | Not Available | Not Available |
| LEVEL 5 | No Level | Aircraft Instrumentation and Control Engineer | Automotive Instrumentation Measurement Engineer | Instrumentation and Control Engineer |
| LEVEL 4 | No Level | Aircraft Instrumentation and Control Assistant Engineer | Automotive Instrumentation Measurement Assistant Engineer | Instrumentation and Control Assistant Engineer |
| LEVEL 3 | Camera & Photographic Equipment Repairer | Aircraft Instrumentation and Control Supervisor | Automotive Instrumentation Measurement Supervisor | Instrumentation and Control Supervisor |
| LEVEL 2 | No Level | Aircraft Instrumentation and Control Technician | Automotive Instrumentation Measurement Technician | Instrumentation and Control Technician |
| LEVEL 1 | No Level | No Level | No Level | No Level |

Table 4.2d: Group 331 Occupational Structure (5 of 9)

| SECTION | (C) MANUFACTURING | | | | |
|---|---|---|---|---|---|
| DIVISION | (33) REPAIR OF MACHINERY AND EQUIPMENT | | | | |
| GROUP | (331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT | | | | |
| AREA | REPAIR AND MAINTENANCE OF THE MEASURING, TESTING, NAVIGATING AND CONTROL EQUIPMENT (WATCHES) | REPAIR AND MAINTENANCE OF THE MEASURING, TESTING, NAVIGATING AND CONTROL EQUIPMENT (TIME CLOCKS) | REPAIR AND MAINTENANCE OF IRRADIATION, ELECTRO MEDICAL AND ELECTROTHERAPEUTIC EQUIPMENT | REPAIR AND MAINTENANCE OF IRRADIATION, ELECTRO MEDICAL AND ELECTROTHERAPEUTIC EQUIPMENT (PACEMAKERS) | REPAIR AND MAINTENANCE OF IRRADIATION, ELECTRO MEDICAL AND ELECTROTHERAPEUTIC EQUIPMENT (HEARING AIDS) |
| **LEVEL 8** | Not Available | Not Available | Not Available | Not Available | Not Available |
| **LEVEL 7** | Not Available | Not Available | Not Available | Not Available | Not Available |
| **LEVEL 6** | Not Available | Not Available | Not Available | Not Available | Not Available |
| **LEVEL 5** | No Level | No Level | Biomedical Equipment Maintenance Engineer | Pacemaker Technician | Hearing Aid Specialist |
| **LEVEL 4** | No Level | No Level | Biomedical Equipment Maintenance Assistant Engineer | No Level | Hearing Aid Assistant Specialist |
| **LEVEL 3** | Watch Repair Technician | Clocksmith | Biomedical Equipment Maintenance Supervisor | No Level | Hearing Aid Technician |
| **LEVEL 2** | No Level | No Level | Biomedical Equipment Maintenance Technician | No Level | No Level |
| **LEVEL 1** | No Level | No Level | No Level | No Level | No Level |

Table 4.2e: Group 331 Occupational Structure (6 of 9)

| SECTION | (C) MANUFACTURING | | |
|---|---|---|---|
| DIVISION | (33) REPAIR OF MACHINERY AND EQUIPMENT | | |
| GROUP | (331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT | | |
| AREA | REPAIR OF OPTICAL INSTRUMENTS AND PHOTOGRAPHIC EQUIPMENT (BINOCULARS, MICROSCOPES (EXCEPT ELECTRON, PROTON), TELESCOPES, PRISMS AND LENSES (EXCEPT OPHTHALMIC)) | REPAIR OF OPTICAL INSTRUMENTS AND PHOTOGRAPHIC EQUIPMENT (PHOTOGRAPHIC EQUIPMENT (IF THE USE MAINLY COMMERCIAL)) | REPAIR OF ELECTRICAL EQUIPMENT |
| LEVEL 8 | Not Available | Not Available | Not Available |
| LEVEL 7 | Not Available | Not Available | Not Available |
| LEVEL 6 | Not Available | Not Available | Not Available |
| LEVEL 5 | No Level | No Level | Mechanical & Electrical Maintenance Engineer* ** |
| LEVEL 4 | No Level | No Level | Mechanical & Electrical Maintenance Assistant Engineer* ** |
| LEVEL 3 | Microscope Service Technician | Camera & Photographic Equipment Repairer | Mechanical & Electrical Maintenance Supervisor* |
| LEVEL 2 | No Level | No Level | Mechanical & Electrical Maintenance Technician* |
| LEVEL 1 | No Level | No Level | No Level |

Note: *Critical Job Titles
**Jobs relevant to IR 4.0

Table 4.2f: Group 331 Occupational Structure (7 of 9)

| SECTION | (C) MANUFACTURING | | | | | |
|---|---|---|---|---|---|---|
| DIVISION | (33) REPAIR OF MACHINERY AND EQUIPMENT | | | | | |
| GROUP | (331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT | | | | | |
| AREA | REPAIR OF MACHINERY (AGRICULTURAL) | REPAIR OF TRANSPORT EQUIPMENT (SHIP HULL) | REPAIR OF TRANSPORT EQUIPMENT (SHIP MECHANICAL & PIPING SYSTEM) | REPAIR OF TRANSPORT EQUIPMENT (SHIP ELECTRONIC SYSTEM) | REPAIR OF TRANSPORT EQUIPMENT (SHIP ELECTRICAL SYSTEM) | REPAIR OF TRANSPORT EQUIPMENT (SHIP ENGINE MAINTENANCE) |
| LEVEL 8 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 7 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 6 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 5 | Agricultural Machinery Maintenance Engineer | Ship Hull and Superstructure Construction & Maintenance Engineer | Ship Mechanical & Piping System Installation & Maintenance Engineer | Ship Electronic System Installation & Maintenance Engineer | Ship Electrical System Installation & Maintenance Engineer | Second Watchkeeping Engineer |
| LEVEL 4 | Agricultural Machinery Maintenance Assistant Engineer | Ship Hull and Superstructure Construction & Maintenance Assistant Engineer | Ship Mechanical & Piping System Installation & Maintenance Assistant Engineer | Ship Electronic System Installation & Maintenance Assistant Engineer | Ship Electrical System Installation & Maintenance Assistant Engineer | Watch Keeping Engineer |
| LEVEL 3 | Agricultural Machinery Maintenance Technician | Ship Hull and Superstructure Construction & Maintenance Supervisor | Ship Mechanical & Piping System Installation & Maintenance Supervisor | Ship Electronic System Installation & Maintenance Supervisor | Ship Electrical System Installation & Maintenance Supervisor | Marine Engine Operation and Maintenance Supervisor |
| LEVEL 2 | Agricultural Machinery Maintenance Junior Technician | Ship Hull and Superstructure Construction & Maintenance Fitter | Ship Mechanical & Piping System Installation & Maintenance Fitter | Ship Electronic System Installation & Maintenance Fitter | Ship Electrical System Installation & Maintenance Fitter | Marine Engine Watchkeeper |
| LEVEL 1 | No Level | No Level | No Level | No Level | No Level | No Level |

Table 4.2g: Group 331 Occupational Structure (8 of 9)

| SECTION | (C) MANUFACTURING | | | | | |
|---|---|---|---|---|---|---|
| **DIVISION** | **(33) REPAIR OF MACHINERY AND EQUIPMENT** | | | | | |
| **GROUP** | **(331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT** | | | | | |
| **AREA** | **REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (LOCOMOTIVES AND RAILROAD CARS (EXCEPT FACTORY REBUILDING OR FACTORY CONVERSION))** | **REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AIRCRAFT MECHNICAL)** | **REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AVIONICS ELECTRICAL)** | **REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AVIONICS INSTRUMENTATION)** | **REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (STRUCTURE REPAIR)** | **REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AVIATION WELDING)** |
| **LEVEL 8** | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| **LEVEL 7** | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| **LEVEL 6** | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| **LEVEL 5** | Rolling Stock Maintenance Engineer | Aviation Mechanical Engineer | Avionics Maintenance Engineer (Electrical) | Avionics Maintenance Engineer (Instrumentation) | Structure Repair Engineer | Aviation Welding Engineer |
| **LEVEL 4** | Rolling Stock Maintenance Assistant Engineer | Aviation Mechanical Assistant Engineer | Avionics Maintenance Engineer | Avionics Maintenance Engineer | Structure Repair Assistant Engineer | Aviation Welding Assistant Engineer |
| **LEVEL 3** | Rolling Stock Maintenance Supervisor | Aviation Mechanical Supervisor | Aviation Mechanical Supervisor | Aviation Mechanical Supervisor | Structure Repair Supervisor | Aviation Welding Supervisor |
| **LEVEL 2** | Rolling Stock Maintenance Technician | Aviation Mechanical Technician | Aviation Mechanical Technician | Aviation Mechanical Technician | Structure Repair Technician | Aviation Welder |
| **LEVEL 1** | No Level | No Level | No Level | No Level | No Level | No Level |

Table 4.2h: Group 331 Occupational Structure (9 of 9)

| SECTION | (C) MANUFACTURING | | | |
|---|---|---|---|---|
| DIVISION | (33) REPAIR OF MACHINERY AND EQUIPMENT | | | |
| GROUP | (331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT | | | |
| AREA | REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AIRCRAFT ENGINES - TURBINE) | REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AIRCRAFT ENGINES - ROTOCRAFT) | REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (ANIMAL DRAWN BUGGIES AND WAGONS) | REPAIR OF OTHER EQUIPMENT (ORGANS AND OTHER HISTORICAL MUSICAL INSTRUMENTS) |
| LEVEL 8 | Not Available | Not Available | Not Available | Not Available |
| LEVEL 7 | Not Available | Not Available | Not Available | Not Available |
| LEVEL 6 | Not Available | Not Available | Not Available | Not Available |
| LEVEL 5 | Turbine Aircraft Engine Maintenance Engineer | Rotocraft Aircraft Engine Maintenance Engineer | No Level | No Level |
| LEVEL 4 | Turbine Aircraft Engine Maintenance Assistant Engineer | Rotocraft Aircraft Engine Maintenance Assistant Engineer | No Level | No Level |
| LEVEL 3 | Aircraft Engine Maintenance Supervisor | Aircraft Engine Maintenance Supervisor | Animal Drawn Buggies and Wagons Supervisor | Musical Instrument Maintenance Supervisor |
| LEVEL 2 | Aircraft Engine Maintenance Technician | Aircraft Engine Maintenance Technician | Animal Drawn Buggies and Wagons Technician | Musical Instrument Maintenance Technician |
| LEVEL 1 | No Level | No Level | No Level | No Level |

Table 4.3: Group 332 Occupational Structure (1 of 1)

| SECTION | (C) MANUFACTURING | | | | | |
|---|---|---|---|---|---|---|
| DIVISION | (33) REPAIR OF MACHINERY AND EQUIPMENT | | | | | |
| GROUP | (332) INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT | | | | | |
| AREA | INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (HYDRAULIC) | INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (PNEUMATIC) | INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRICAL) | INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRONIC) | INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHANICAL) | INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHATRONIC) |
| LEVEL 8 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 7 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 6 | Hydraulic System Specialist | Pneumatic System Specialist | Electrical System Specialist* ** | Electronic System Specialist* ** | Mechanical System Specialist* ** | Mechatronic System Specialist* ** |
| LEVEL 5 | Hydraulic Maintenance Engineer | Pneumatic Maintenance Engineer | Electrical Maintenance Engineer* ** | Electronic Maintenance Engineer* ** | Mechanical Maintenance Engineer* ** | Mechatronic Maintenance Engineer* ** |
| LEVEL 4 | Hydraulic Maintenance Assistant Engineer | Pneumatic Maintenance Assistant Engineer | Electrical Maintenance Assistant Engineer* ** | Electronic Maintenance Assistant Engineer* ** | Mechanical Maintenance Assistant Engineer* ** | Mechatronic Maintenance Assistant Engineer* ** |
| LEVEL 3 | Hydraulic Maintenance Supervisor | Pneumatic Maintenance Supervisor | Electrical Maintenance Supervisor* | Electronic Maintenance Supervisor* | Mechanical Maintenance Supervisor* | Mechatronic Maintenance Supervisor* |
| LEVEL 2 | Hydraulic Maintenance Technician | Pneumatic Maintenance Technician | Electrical Maintenance Technician* | Electronic Maintenance Technician* | Mechanical Maintenance Technician* | Mechatronic Maintenance Technician* |
| LEVEL 1 | No Level | No Level | No Level | No Level | No Level | No Level |

Note: *Critical Job Titles
**Jobs relevant to IR 4.0

Table 4.4: Summary of Job Titles

| No | Job Area | Level | | | | | | | | Total Identified Job Titles |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| 331-REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT | | | | | | | | | | |
| 1. | Hydraulic | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 2. | Pneumatic | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 3. | Electrical | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 4. | Electronic | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 5. | Mechanical | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 6. | Mechatronic | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 7. | Rotary Engine | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 8. | Steam Engine | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 9. | Rotary Vane Engine | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 10. | Gas Engine | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 11. | HVAC | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 12. | ACMV | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 13. | Plants & Mills Machinery | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 14. | Water Treatment Machinery | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 15. | Heavy Machinery Maintenance | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 16. | Weapon Technology | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 17. | Ammunition & Explosive | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 18. | Electronic and Optical Equipment | Nil | Nil | 1 | Nil | Nil | Nil | Nil | Nil | 1 |
| 19. | Aircraft Engine Instruments | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 20. | Automotive Emissions Testing Equipment | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 21. | Instrumentation and Control | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 22. | Watches | Nil | Nil | 1 | Nil | Nil | Nil | Nil | Nil | 1 |
| 23. | Clocks | Nil | Nil | 1 | Nil | Nil | Nil | Nil | Nil | 1 |
| 24. | Irradiation, Electro Medical and Electrotherapeutic Equipment | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 25. | Pacemakers | Nil | Nil | Nil | Nil | 1 | Nil | Nil | Nil | 1 |
| 26. | Hearing Aids | Nil | Nil | 1 | 1 | 1 | Nil | Nil | Nil | 3 |
| 27. | Binoculars, Microscopes, Telescopes, Prisms and Lenses | Nil | Nil | 1 | Nil | Nil | Nil | Nil | Nil | 1 |
| 28. | Photographic Equipment (If the Use Mainly Commercial) | Nil | Nil | 1 | Nil | Nil | Nil | Nil | Nil | 1 |
| 29. | Electrical Equipment | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |

| No | Job Area | Level | | | | | | | | Total Identified Job Titles |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| 30. | Agricultural Machinery | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 31. | Ship Hull Aircraft | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 32. | Ship Mechanical & Piping System | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 33. | Ship Electronic System | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 34. | Ship Electrical System | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 35. | Ship Engine Maintenance | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 36. | Locomotives and Railroad Cars | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 37. | Aircraft Mechanical | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 38. | Aircraft Avionics Electrical | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 39. | Aircraft Avionics Instrumentation | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 40. | Aircraft Structure Repair | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 41. | Aviation Welding | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 42. | Aircraft Engines (Turbine) | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 43. | Aircraft Engines (Rotorcraft) | Nil | 1 | 1 | 1 | 1 | Nil | Nil | Nil | 4 |
| 44. | Animal Drawn Buggies and Wagons | Nil | 1 | 1 | Nil | Nil | Nil | Nil | Nil | 2 |
| 45. | Organs and Other Historical Musical Instruments | Nil | 1 | 1 | Nil | Nil | Nil | Nil | Nil | 2 |
| 332-Installation of industrial machinery and equipment | | | | | | | | | | |
| 46. | Hydraulic | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 47. | Pneumatic | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 48. | Electrical | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 49. | Electronic | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 50. | Mechanical | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| 51. | Mechatronic | Nil | 1 | 1 | 1 | 1 | 1 | Nil | Nil | 5 |
| **Grand Total of Identified Job Titles** | | | | | | | | | | **200** |

## 4.4 TABLE OF JOB RESPONSIBILITIES VS NOSS LEVEL (AREA DESCRIPTION)

Division: C-33 Repair of Machinery and Equipment
Group: 331 - Repair of Fabricated Metal Products, Machinery and Equipment

Table 4.5: List of Responsibilities for Group 331 according to NOSS Levelling (1 of 16)

| AREA | **REPAIR OF FABRICATED METAL PRODUCTS (HYDRAULIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (PNEUMATIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (ELECTRICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 6 | **Hydraulic System Specialist**<br>1) Assist the superintendent and/or solve the hydraulic system related problems and failures on board of the equipment in the day to day fleet operations.<br>2) Provide on request optimal technical support in case of equipment malfunctioning.<br>3) Spot problems/risks and carry out checks on the control systems/applications, thereby identifying possible sources of malfunctioning risks or incorrect use promptly and avoiding problems.<br>4) Assist to ensure that the hydraulic equipment is being maintained to the company standards and the certifying authorities.<br>5) Offer technical and managing support between the hydraulic suppliers and other disciplines to the project managers or superintendents during the project execution phase in order to achieve the best possible project result.<br>6) Attend commissioning's or commissions hydraulic installations in consultation with the relevant people.<br>7) Attend the Factory Acceptance Test (FAT) | **Hydraulic System Specialist**<br>1) Load and Motion Analysis. Solving formulas for torque, speed and horsepower for cylinder & air motor driven systems.<br>2) Solves for the reaction forces on a cylinder rod bearing.<br>3) Computes cylinder bore and pressure to move loads with a friction factor.<br>4) Solves for the pressure and suction area to provide the required lifting force using vacuum cups.<br>5) Understands Vacuum generators.<br>6) Provides ISO cleanliness level for system(s)<br>7) Specifies filtration products to maintain ISO cleanliness.<br>8) Specifies flushing and commissioning procedures.<br>9) Calculates air cylinder velocity.<br>10) Selects and sizes conductors based on pressure and flow requirements.<br>11) Computes the necessary CFM airflow and pressure to power a cylinder.<br>12) Computes the necessary CFM airflow and pressure to power an air motor.<br>13) Can calculate and select the proper air over | **Electrical System Specialist**<br>1) Troubleshoot the most difficult instrumentation and electrical problems in the refinery.<br>2) Prepare conceptual idea for final project documentation<br>3) Provide equipment specifications and equipment<br>4) Interpret electrical prints and make up new circuit design changes.<br>5) Capability to install, remove, trouble shoot and repair plant equipment having electrical controls, motors, meter, telephones layout and make up control panels and boxes.<br>6) Capability and knowledge of hydraulic, pneumatic and mechanical repair. |

| AREA | **REPAIR OF FABRICATED METAL PRODUCTS (HYDRAULIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (PNEUMATIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (ELECTRICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| | and the Site Acceptance Test (SAT).<br>8) Process diagrams, drawings and documentation. | oil intensifier.<br>14) Calculate the kinetic energy required to stop a load with a shock absorber.<br>15) Calculate the Cv flow factor for an air valve.<br>16) Understands critical (sonic) velocity and how to calculate it.<br>17) Calculate the required compressor delivery capacity for system demand<br>18) Understands ladder logic.<br>19) Uses Ohm's law and Kirchhoff's law to solve series-parallel circuits for voltage, current, and resistance.<br>20) Matches appropriate wiring arrangements between PLC's and directional control valves.<br>21) Can do system trouble shooting.<br>22) Able to do compressed air audits.<br>23) Promotes safe working conditions with pressurized systems. | |
| Level 5 | **Hydraulic Maintenance Engineer**<br>1) Manage all hydraulic equipment to prepare all bid proposals and design all hydraulic systems according to contract specifications and prepare prices for all diagrams.<br>2) Prepare all procurement specifications and prepare all technical procedures and bill of materials and provide support to all material requirements and review all designs to improve performance.<br>3) Perform research on new technology to develop new products and assist to prepare all prototype and ensure utilisation of all engineering tools for various projects. | **Hydraulic Maintenance Engineer**<br>1) Manage all pneumatic equipment to prepare all bid proposals and design all pneumatic systems according to contract specifications and prepare prices for all diagrams.<br>2) Prepare all procurement specifications and prepare all technical procedures and bill of materials and provide support to all material requirements and review all designs to improve performance.<br>3) Perform research on new technology to develop new products and assist to prepare | **Electrical Maintenance Engineer**<br>1) Evaluates electrical systems, products, components, and applications by designing and conducting research programs; applying knowledge of electricity and materials.<br>2) Confirms system's and components' capabilities by designing testing methods; testing properties.<br>3) Develops electrical products by studying customer requirements; researching and testing manufacturing and assembly methods and materials. |

| AREA | **REPAIR OF FABRICATED METAL PRODUCTS (HYDRAULIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (PNEUMATIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (ELECTRICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| | 4) Manage efficient communication with all internal and external customers and suppliers and resolve all technical issues and prepare drafts for all engineering projects and recommend change proposals.<br>5) Monitor efficient working of all hydraulic equipment and perform troubleshoot on same and provide support to all process engineers and make required adjustments.<br>6) Analyse all equipment designs and recommend improvement and implement same and prepare all formal and informal training for all personnel.<br>7) Evaluate all performance requirements according to customer specifications and prepare all required documents and perform tests on all sales and customers and provide resolution according to standard products.<br>8) Administer all specification for all orders and evaluate all test results and monitor all contract performance and maintain and improve all test logs and recommend improvement to all information and maintain accuracy of all projects.<br>9) Manage all communication with team work and ensure adherence to corporate standards and prepare designs of all hydraulic equipment according to assemble requirements. | all prototype and ensure utilisation of all engineering tools for various projects.<br>4) Manage efficient communication with all internal and external customers and suppliers and resolve all technical issues and prepare drafts for all engineering projects and recommend change proposals.<br>5) Monitor efficient working of all pneumatic equipment and perform troubleshoot on same and provide support to all process engineers and make required adjustments.<br>6) Analyse all equipment designs and recommend improvement and implement same and prepare all formal and informal training for all personnel.<br>7) Evaluate all performance requirements according to customer specifications and prepare all required documents and perform tests on all sales and customers and provide resolution according to standard products.<br>8) Administer all specification for all orders and evaluate all test results and monitor all contract performance and maintain and improve all test logs and recommend improvement to all information and maintain accuracy of all projects.<br>9) Manage all communication with team work and ensure adherence to corporate standards and prepare designs of all hydraulic | 4) Develops manufacturing processes by designing and modifying equipment for building and assembling electrical components; soliciting observations from operators.<br>5) Assures product quality by designing electrical testing methods; testing finished products and system capabilities.<br>6) Prepares product reports by collecting, analysing, and summarising information and trends.<br>7) Provides engineering information by answering questions and requests.<br>8) Maintains product and company reputation by complying with federal and state regulations.<br>9) Keeps equipment operational by following manufacturer's instructions and established procedures; requesting repair service.<br>10) Maintains product data base by writing computer programs; entering data.<br>11) Completes projects by training and guiding technicians.<br>12) Maintains professional and technical knowledge by attending educational workshops; reviewing professional publications; establishing personal networks; participating in professional societies.<br>Contributes to team effort by accomplishing related results as needed. |

| AREA | **REPAIR OF FABRICATED METAL PRODUCTS (HYDRAULIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (PNEUMATIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (ELECTRICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| | | equipment according to assemble requirements. | |
| Level 4 | **Hydraulic Maintenance Assistant Engineer**<br>1) Assist in managing all hydraulic equipment to prepare all bid proposals and design all hydraulic systems according to contract specifications and prepare prices for all diagrams.<br>2) Assist in preparing all procurement specifications and prepare all technical procedures and bill of materials and provide support to all material requirements and review all designs to improve performance.<br>3) Assist in performing research on new technology to develop new products and assist to prepare all prototype and ensure utilisation of all engineering tools for various projects.<br>4) Assist in managing efficient communication with all internal and external customers and suppliers and resolve all technical issues and prepare drafts for all engineering projects and recommend change proposals.<br>5) Assist in monitoring efficient working of all hydraulic equipment and perform troubleshoot on same and provide support to all process engineers and make required adjustments.<br>6) Assist in analysing all equipment designs and recommend improvement and implement same and prepare all formal and informal training for all personnel. | **Pneumatic Maintenance Assistant Engineer**<br>1) Assist in managing all pneumatic equipment to prepare all bid proposals and design all pneumatic systems according to contract specifications and prepare prices for all diagrams.<br>2) Assist in preparing all procurement specifications and prepare all technical procedures and bill of materials and provide support to all material requirements and review all designs to improve performance.<br>3) Assist in performing research on new technology to develop new products and assist to prepare all prototype and ensure utilisation of all engineering tools for various projects.<br>4) Assist in managing efficient communication with all internal and external customers and suppliers and resolve all technical issues and prepare drafts for all engineering projects and recommend change proposals.<br>5) Assist in monitoring efficient working of all pneumatic equipment and perform troubleshoot on same and provide support to all process engineers and make required adjustments.<br>6) Assist in analysing all equipment designs and recommend improvement and implement same and prepare all formal and informal | **Electrical Maintenance Engineer**<br>1) Evaluates electrical systems, products, components, and applications by designing and conducting research programs; applying knowledge of electricity and materials.<br>2) Confirms system's and components' capabilities by designing testing methods; testing properties.<br>3) Develops electrical products by studying customer requirements; researching and testing manufacturing and assembly methods and materials.<br>4) Develops manufacturing processes by designing and modifying equipment for building and assembling electrical components; soliciting observations from operators.<br>5) Assures product quality by designing electrical testing methods; testing finished products and system capabilities.<br>6) Prepares product reports by collecting, analysing, and summarising information and trends.<br>7) Provides engineering information by answering questions and requests.<br>8) Maintains product and company reputation by complying with federal and state regulations.<br>9) Keeps equipment operational by following manufacturer's instructions and established |

| AREA | **REPAIR OF FABRICATED METAL PRODUCTS (HYDRAULIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (PNEUMATIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (ELECTRICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| | 7) Assist in evaluating all performance requirements according to customer specifications and prepare all required documents and perform tests on all sales and customers and provide resolution according to standard products.<br>8) Assist in administering all specification for all orders and evaluate all test results and monitor all contract performance and maintain and improve all test logs and recommend improvement to all information and maintain accuracy of all projects.<br>9) Assist in managing all communication with team work and ensure adherence to corporate standards and prepare designs of all hydraulic equipment according to assemble requirements. | training for all personnel.<br>7) Assist in evaluating all performance requirements according to customer specifications and prepare all required documents and perform tests on all sales and customers and provide resolution according to standard products.<br>8) Assist in administering all specification for all orders and evaluate all test results and monitor all contract performance and maintain and improve all test logs and recommend improvement to all information and maintain accuracy of all projects.<br>9) Assist in managing all communication with team work and ensure adherence to corporate standards and prepare designs of all pneumatic equipment according to assemble requirements. | procedures; requesting repair service.<br>10) Maintains product data base by writing computer programs; entering data.<br>11) Completes projects by training and guiding technicians.<br>12) Maintains professional and technical knowledge by attending educational workshops; reviewing professional publications; establishing personal networks; participating in professional societies.<br>13) Contributes to team effort by accomplishing related results as needed. |
| Level 3 | **Hydraulic Maintenance Supervisor**<br>1) Check tools, equipment and component for assembly work<br>2) Determine instructions and working procedure<br>3) Comply with company safety, rules & regulations<br>4) Supervise assembly works<br>5) Determine technical findings at progress capture form<br>6) Support cost reductions program counter measure for assembly hydraulic<br>7) Supervise installation works, repair works and | **Pneumatic Maintenance Supervisor**<br>1) Supervise repairing pneumatic components in the facilities or outside<br>2) Supervise assembling fabricated parts at floor stations<br>3) Use hand tools and power tools for assembling<br>4) Supervise testing and calibration parts and mechanisms to meet product specifications<br>5) Check units that fail tests or tolerance levels and repairs<br>6) Keep updated on technological | **Electrical Maintenance Supervisor**<br>1) Supervise assembling works, installation, testing, and maintaining electrical or electronic wiring, equipment, appliances, apparatus, and fixtures, using hand tools and power tools.<br>2) Supervise diagnosing malfunctioning systems, apparatus, and components, using test equipment and hand tools, to locate the cause of a breakdown and correct the problem.<br>3) Supervise connecting wires to circuit breakers, transformers, or other components. |

| AREA | **REPAIR OF FABRICATED METAL PRODUCTS (HYDRAULIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (PNEUMATIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (ELECTRICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| | maintaining hydraulic equipment and machinery<br>8) Supervise maintenance activities<br>9) Check test units for performing equipment tests<br>10) Check tests procedures and results<br>11) Ensure the project follows established guidelines<br>12) Diagnostically troubleshoot component defects<br>13) Supervise corrective action activities<br>14) Liaise with relevant department | advancements in the area | 4) Supervise inspecting electrical systems, equipment, and components to identify hazards, defects, and the need for adjustment or repair, and to ensure compliance with codes.<br>5) Advise management on whether continued operation of equipment could be hazardous.<br>6) Supervise testing electrical systems and continuity of circuits in electrical wiring, equipment, and fixtures, using testing devices such as ohmmeters, voltmeters, and oscilloscopes, to ensure compatibility and safety of system.<br>7) Supervise plan layout and installation of electrical wiring, equipment and fixtures, based on job specifications and local codes.<br>8) Check sketches or follow blueprints to determine the location of wiring and equipment and to ensure conformance to building and safety codes.<br>9) Use a variety of tools and equipment such as power construction equipment, measuring devices, power tools, and testing equipment including oscilloscopes, ammeters, and test lamps.<br>10) Supervise repairing or replacing wiring, equipment, and fixtures, using hand tools and power tools. |

| AREA | **REPAIR OF FABRICATED METAL PRODUCTS (HYDRAULIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (PNEUMATIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (ELECTRICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 2 | **Hydraulic Maintenance Technician**<br>1) Prepare tools, equipment and component for assembly work<br>2) Determine instructions and working procedure<br>3) Comply with company safety, rules & regulations<br>4) Carry out assembly works<br>5) Identify technical findings at progress capture form<br>6) Support cost reductions program counter measure for assembly hydraulic<br>7) Install, repair and maintain hydraulic equipment and machinery<br>8) Carry out maintenance activities<br>9) Set up test units for performing equipment tests<br>10) Record tests procedures and results<br>11) Ensure the project follows established guidelines<br>12) Diagnostically troubleshoot component defects<br>13) Carry out corrective action<br>14) Report any safety, risk or paper discrepancies to superior | **Pneumatic Maintenance Technician**<br>1) Repair pneumatic components in the facilities or outside<br>2) Assemble fabricated parts at floor stations<br>3) Use hand tools and power tools for assembling<br>4) Test and calibrate parts and mechanisms to meet product specifications<br>5) Identify units that fail tests or tolerance levels and repairs<br>6) Keep updated on technological advancements in the area | **Electrical Maintenance Technician**<br>1) Assemble, install, test, and maintain electrical or electronic wiring, equipment, appliances, apparatus, and fixtures, using hand tools and power tools.<br>2) Diagnose malfunctioning systems, apparatus, and components, using test equipment and hand tools, to locate the cause of a breakdown and correct the problem.<br>3) Connect wires to circuit breakers, transformers, or other components.<br>4) Inspect electrical systems, equipment, and components to identify hazards, defects, and the need for adjustment or repair, and to ensure compliance with codes.<br>5) Advise management on whether continued operation of equipment could be hazardous.<br>6) Test electrical systems and continuity of circuits in electrical wiring, equipment, and fixtures, using testing devices such as ohmmeters, voltmeters, and oscilloscopes, to ensure compatibility and safety of system.<br>7) Plan layout and installation of electrical wiring, equipment and fixtures, based on job specifications and local codes.<br>8) Prepare sketches or follow blueprints to determine the location of wiring and equipment and to ensure conformance to building and safety codes.<br>9) Use a variety of tools and equipment such as power construction equipment, measuring devices, power tools, and testing equipment including oscilloscopes, ammeters, and test |

| AREA | **REPAIR OF FABRICATED METAL PRODUCTS (HYDRAULIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (PNEUMATIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (ELECTRICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| | | | lamps.<br>10) Repair or replace wiring, equipment, and fixtures, using hand tools and power tools. |
| Level 1 | N/A | N/A | N/A |

Table 4.5a: List of Responsibilities for Group 331 according to NOSS Levelling (2 of 16)

| AREA | **REPAIR OF FABRICATED METAL PRODUCTS (ELECTRONIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHANICAL)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 6 | **Electronic System Specialist**<br>1) Troubleshoot the most difficult instrumentation and electronic problems in the refinery.<br>2) Prepare conceptual idea for final project documentation<br>3) Provide equipment specifications and equipment<br>4) Interpret electronic prints and make up new circuit design changes.<br>5) Capability to install, remove, trouble shoot and repair plant equipment having electronic controls, motors, meter, telephones layout and make up control panels and boxes.<br>6) Capability and knowledge of hydraulic, pneumatic and mechanical repair. | **Mechanical System Specialist**<br>1) Endorse mechanical and electromechanical systems and products<br>2) Evaluate system and product capabilities by designing feasibility and testing methods<br>3) Prepare conceptual design for mechanical system<br>4) Develops manufacturing processes by designing and modifying equipment for fabricating, building, assembling, and installing components.<br>5) Assures system and product quality by designing testing methods; testing finished-product and system capabilities; confirming fabrication, assembly, and installation processes.<br>6) Provides engineering information by answering questions and requests.<br>7) Maintains product and company reputation by complying with government regulations.<br>8) Maintains system and product data base by writing computer programs and entering data.<br>9) Maintains professional and technical knowledge by attending educational workshops; reviewing professional publications; establishing personal networks; participating in professional societies. | **Mechatronic System Specialist**<br>1) Endorse design engineering systems for the automation of industrial tasks.<br>2) Create mechanical design documents for parts, assemblies, or finished products.<br>3) Design advanced electronic control systems for mechanical systems.<br>4) Maintain technical project files.<br>5) Create embedded software design programs.<br>6) Analyse existing development or manufacturing procedures and suggest improvements.<br>7) Endorse design solutions implementation and testing.<br>8) Evaluate simulation mechatronic design concepts.<br>9) Upgrade the design of existing devices by adding mechatronic elements.<br>10) Design advanced precision equipment for accurate or controlled applications.<br>11) Research, select, or apply sensors, communication technologies, or control devices for motion control, position sensing, pressure sensing, or electronic communication.<br>12) Design, develop, or implement control circuits or algorithms for electromechanical or pneumatic devices or systems.<br>13) Monitor or calibrate automated systems, industrial control systems, or system components to maximize efficiency of |

| AREA | **REPAIR OF FABRICATED METAL PRODUCTS (ELECTRONIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHANICAL)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| | | | production. |
| Level 5 | **Electronic Maintenance Engineer**<br>1) Review or prepare budget and cost estimates for equipment, construction, and installation projects, and control expenditures.<br>2) Represent employer at conferences, meetings, boards, panels, committees, and working groups to present, explain, and defend findings and recommendations, negotiate compromises and agreements and exchange information.<br>3) Design electronic components and software, products and systems for commercial, industrial, medical, military, and scientific applications.<br>4) Provide technical support and instruction to staff and customers regarding equipment standards, and help solve specific, difficult in-service engineering problems.<br>5) Operate computer-assisted engineering and design software and equipment to perform engineering tasks.<br>6) Analyse system requirements, capacity, cost, and customer needs to determine feasibility of project and develop system plan.<br>7) Confer with engineers, customers, vendors and others to discuss existing and potential engineering projects or products.<br>8) Review and evaluate work of others, inside and outside the organization, to ensure effectiveness, technical adequacy and compatibility in the resolution of complex engineering problems. | **Mechanical Maintenance Engineer**<br>1) Evaluates mechanical and electromechanical systems and products by designing and conducting research programs; applying principles of mechanics, thermodynamics, hydraulics, heat transfer, and materials.<br>2) Confirms system and product capabilities by designing feasibility and testing methods; testing properties.<br>3) Develops mechanical and electromechanical products by studying customer requirements; researching and testing manufacturing and assembly methods and materials; soliciting observations from operators.<br>4) Develops manufacturing processes by designing and modifying equipment for fabricating, building, assembling, and installing components.<br>5) Assures system and product quality by designing testing methods; testing finished-product and system capabilities; confirming fabrication, assembly, and installation processes.<br>6) Prepares product reports by collecting, analysing, and summarising information and trends.<br>7) Provides engineering information by answering questions and requests.<br>8) Maintains product and company reputation by complying with government regulations.<br>9) Keeps equipment operational by coordinating maintenance and repair services; following | **Mechatronic Maintenance Engineer**<br>1) Oversee the work of contractors in accordance with project requirements.<br>2) Design engineering systems for the automation of industrial tasks.<br>3) Create mechanical design documents for parts, assemblies, or finished products.<br>4) Design advanced electronic control systems for mechanical systems.<br>5) Maintain technical project files.<br>6) Create embedded software design programs.<br>7) Analyse existing development or manufacturing procedures and suggest improvements.<br>8) Implement or test design solutions.<br>9) Identify and select materials appropriate for mechatronic system designs.<br>10) Create mechanical models and tolerance analyses to simulate mechatronic design concepts.<br>11) Upgrade the design of existing devices by adding mechatronic elements.<br>12) Design advanced precision equipment for accurate or controlled applications.<br>13) Publish engineering reports documenting design details or qualification test results.<br>14) Provide consultation or training on topics such as mechatronics or automated control.<br>15) Research, select, or apply sensors, communication technologies, or control devices for motion control, position sensing, pressure sensing, or electronic |

| AREA | **REPAIR OF FABRICATED METAL PRODUCTS (ELECTRONIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHANICAL)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| | 9) Determine material and equipment needs and order supplies.<br>10) Inspect electronic equipment, instruments, products, and systems to ensure conformance to specifications, safety standards, and applicable codes and regulations.<br>11) Evaluate operational systems, prototypes and proposals and recommend repair or design modifications based on factors such as environment, service, cost, and system capabilities.<br>12) Prepare documentation containing information such as confidential descriptions and specifications of proprietary hardware and software, product development and introduction schedules, product costs, and information about product performance weaknesses.<br>13) Direct and coordinate activities concerned with manufacture, construction, installation, maintenance, operation, and modification of electronic equipment, products, and systems.<br>14) Plan and develop applications and modifications for electronic properties used in components, products, and systems, to improve technical performance.<br>15) Prepare engineering sketches and specifications for construction, relocation, and installation of equipment, facilities, products, and systems.<br>16) Plan and implement research, methodology, and procedures to apply principles of | manufacturer's instructions and established procedures; requesting special services.<br>10) Maintains system and product data base by writing computer programs and entering data.<br>11) Maintains professional and technical knowledge by attending educational workshops; reviewing professional publications; establishing personal networks; participating in professional societies.<br>12) Contributes to team effort by accomplishing related results as needed. | communication.<br>16) Design, develop, or implement control circuits or algorithms for electromechanical or pneumatic devices or systems.<br>17) Conduct studies to determine the feasibility, costs, or performance benefits of new mechatronic equipment.<br>18) Develop electronic, mechanical, or computerized processes to perform tasks in dangerous situations, such as underwater exploration or extra-terrestrial mining. Design mechatronics components for computer-controlled products, such as cameras, video recorders, automobiles, or airplanes.<br>19) Design or develop automated control systems for environmental applications, such as waste processing, air quality, or water quality systems.<br>20) Design self-monitoring mechanical systems, such as gear systems that monitor loading or condition of systems to detect and prevent failures.<br>21) Monitor or calibrate automated systems, industrial control systems, or system components to maximize efficiency of production. |

| AREA | **REPAIR OF FABRICATED METAL PRODUCTS (ELECTRONIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHANICAL)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| | electronic theory to engineering projects.<br>17) Prepare, review, and maintain maintenance schedules, design documentation and operational reports and charts. | | |
| Level 4 | **Electronic Maintenance Assistant Engineer**<br>1) Assist in reviewing or preparing budget and cost estimates for equipment, construction, and installation projects, and control expenditures.<br>2) Assist in designing electronic components and software, products and systems for commercial, industrial, medical, military, and scientific applications.<br>3) Assist in providing technical support and instruction to staff and customers regarding equipment standards, and help solve specific, difficult in-service engineering problems.<br>4) Assist in operating computer-assisted engineering and design software and equipment to perform engineering tasks.<br>5) Assist in analysing system requirements, capacity, cost, and customer needs to determine feasibility of project and develop system plan.<br>6) Liaise with other relevant department<br>7) Assist in reviewing and evaluating work of others, inside and outside the organization, to ensure effectiveness, technical adequacy and compatibility in the resolution of complex engineering problems.<br>8) Determine material and equipment needs and order supplies.<br>9) Assist in inspecting electronic equipment, | **Mechanical Maintenance Assistant Engineer**<br>1) Assist in evaluating mechanical and electromechanical systems and products by designing and conducting research programs; applying principles of mechanics, thermodynamics, hydraulics, heat transfer, and materials.<br>2) Assist in developing mechanical and electromechanical products by studying customer requirements; researching and testing manufacturing and assembly methods and materials; soliciting observations from operators.<br>3) Assist in developing manufacturing processes by designing and modifying equipment for fabricating, building, assembling, and installing components.<br>4) Assist in assuring system and product quality by designing testing methods; testing finished- product and system capabilities; confirming fabrication, assembly, and installation processes.<br>5) Assist in preparing product reports by collecting, analysing, and summarising information and trends.<br>6) Assist in providing engineering information by answering questions and requests.<br>7) Maintains product and company reputation by | **Mechatronic Maintenance Assistant Engineer**<br>1) Oversee the work of contractors in accordance with project requirements.<br>2) Assist in designing engineering systems for the automation of industrial tasks.<br>3) Assist in creating mechanical design documents for parts, assemblies, or finished products.<br>4) Assist in designing advanced electronic control systems for mechanical systems.<br>5) Maintain technical project files.<br>6) Assist in creating embedded software design programs.<br>7) Assist in analysing existing development or manufacturing procedures and suggest improvements.<br>8) Identify and select materials appropriate for mechatronic system designs.<br>9) Assist in creating mechanical models and tolerance analyses to simulate mechatronic design concepts.<br>10) Assist in publishing engineering reports documenting design details or qualification test results.<br>11) Assist in providing consultation or training on topics such as mechatronics or automated control.<br>12) Assist in researching, selecting, or applying sensors, communication technologies, or |

| AREA | **REPAIR OF FABRICATED METAL PRODUCTS (ELECTRONIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHANICAL)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| | instruments, products, and systems to ensure conformance to specifications, safety standards, and applicable codes and regulations.<br>10) Assist in evaluating operational systems, prototypes and proposals and recommend repair or design modifications based on factors such as environment, service, cost, and system capabilities.<br>11) Assist in preparing documentation containing information such as confidential descriptions and specifications of proprietary hardware and software, product development and introduction schedules, product costs, and information about product performance weaknesses.<br>12) Assist in planning and developing applications and modifications for electronic properties used in components, products, and systems, to improve technical performance.<br>13) Assist in preparing engineering sketches and specifications for construction, relocation, and installation of equipment, facilities, products, and systems.<br>14) Assist in preparing, reviewing, and maintaining maintenance schedules, designing documentation and operational reports and charts. | complying with government regulations.<br>8) Keeps equipment operational by coordinating maintenance and repair services; following manufacturer's instructions and established procedures; requesting special services.<br>9) Maintains system and product data base by writing computer programs and entering data.<br>10) Contributes to team effort by accomplishing related results as needed. | control devices for motion control, position sensing, pressure sensing, or electronic communication.<br>13) Assist in designing, developing, or implementing control circuits or algorithms for electromechanical or pneumatic devices or systems.<br>14) Assist in conducting studies to determine the feasibility, costs, or performance benefits of new mechatronic equipment.<br>15) Assist in designing or developing automated control systems for environmental applications, such as waste processing, air quality, or water quality systems.<br>16) Assist in monitoring or calibrating automated systems, industrial control systems, or system components to maximize efficiency of production. |

| AREA | **REPAIR OF FABRICATED METAL PRODUCTS (ELECTRONIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHANICAL)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 3 | **Electronic Maintenance Supervisor**<br>1) Supervise assembling electronic components, subassemblies, products, or systems<br>2) Supervise positioning and aligning parts in specified relationship to each other in jig, fixture, or other holding device<br>3) Supervise crimps, stakes, screws, bolts, rivets, welds, solders, cements, press fits, or performs similar operations to join or secure parts in place, using hand tools, power tools, machines, and equipment<br>4) Supervise mounting assembled components, such as transformers, resistors, transistors, capacitors, integrated circuits, and sockets, on chassis panel<br>5) Supervise connecting component lead wires to printed circuit or routes and connects wires between individual component leads and other components, connectors, terminals, and contact points, using soldering, welding, thermos compression, or related bonding procedures and equipment<br>6) Supervise installing finished assemblies or subassemblies in cases and cabinets<br>7) Supervise assembling and attaches hardware, such as caps, clamps, knobs, and switches, to assemblies<br>8) Supervise performing intermediate assembly tasks, such as potting, encapsulating, sanding, cleaning, epoxy bonding, curing, stamping, etching, impregnating, and colour coding parts and assemblies<br>9) Supervise tends machines that press, shape, | **Mechanical Maintenance Supervisor**<br>1) Read, interpret and follow basic blueprints, diagrams, engineering drawings, specifications, bills of materials, and other written instructions or procedures to accurately assemble equipment and products<br>2) Utilise hand held tools such as a hand-held screw and drill gun<br>3) Supervise performing soldering, which is the process in which two or more metal items are joined together by melting and flowing a filler metal (solder) into the joint<br>4) Monitor inventory of product in work stations<br>5) Monitor quality work checks to insure the product meets quality standards<br>6) Check and verify product defects and complete appropriate documentation when defects are identified<br>7) Supervise rework and/or repair assembled equipment and products according to engineering specification changes<br>8) Perform all work in accordance with quality standards and established safety procedures<br>9) Monitor a clean and safe work area | **Mechatronic Maintenance Supervisor**<br>1) Check trouble areas<br>2) Supervise and monitor corrective action<br>3) Check and monitor equipment improvements to increase operational efficiency<br>4) Maintains appropriate level of technical and professional skills by attending training classes, seminars, exhibits, and trade shows as needed<br>5) Supervise adjustment and/or installs special functional parts of machines, devices and control instruments<br>6) Supervise repairing or replacing defective automation and machinery parts<br>7) Supervise assembling individual components through to complete systems or special machines in accordance with drawings |

| AREA | **REPAIR OF FABRICATED METAL PRODUCTS (ELECTRONIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHANICAL)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| | or wind component parts<br>10) Supervise adjusting or trimming materials from components to achieve specified electrical or dimensional characteristics<br>11) Supervise performing on-line go-not-go testing and inspection, using magnifying devices, measuring instruments, and electronic test equipment, to ensure parts and assemblies meet production specifications and standards<br>12) Supervise performing assembly operations under microscope or other magnifying device<br>13) Occupations related to assembly of printed circuit boards and fabrication of integrated circuit chips are defined under separate definitions | | |
| Level 2 | **Electronic Maintenance Technician**<br>1) Assemble electronic components, subassemblies, products, or systems<br>2) Positions and aligns parts in specified relationship to each other in jig, fixture, or other holding device<br>3) Crimps, stakes, screws, bolts, rivets, welds, solders, cements, press fits, or performs similar operations to join or secure parts in place, using hand tools, power tools, machines, and equipment<br>4) Mounts assembled components, such as transformers, resistors, transistors, capacitors, integrated circuits, and sockets, on chassis panel<br>5) Connects component lead wires to printed | **Mechanical Technician**<br>1) Read, interpret and follow basic blueprints, diagrams, engineering drawings, specifications, bills of materials, and other written instructions or procedures to accurately assemble equipment and products<br>2) Utilise hand held tools such as a hand-held screw and drill gun<br>3) Performing soldering, which is the process in which two or more metal items are joined together by melting and flowing a filler metal (solder) into the joint<br>4) Maintain inventory of product in work stations<br>5) Perform quality work checks to insure the product meets quality standards<br>6) Identify product defects and complete | **Mechatronic Maintenance Technician**<br>1) Identify trouble areas<br>2) Determine corrective action<br>3) Suggest and implements equipment improvements to increase operational efficiency<br>4) Maintains appropriate level of technical and professional skills by attending training classes, seminars, exhibits, and trade shows as needed<br>5) Adjust and/or installs special functional parts of machines, devices and control instruments<br>6) Repairs or replaces defective automation and machinery parts<br>7) Assembling individual components through to complete systems or special machines in |

| AREA | **REPAIR OF FABRICATED METAL PRODUCTS (ELECTRONIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHANICAL)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| | circuit or routes and connects wires between individual component leads and other components, connectors, terminals, and contact points, using soldering, welding, thermos compression, or related bonding procedures and equipment<br>6) Installs finished assemblies or subassemblies in cases and cabinets<br>7) Assembles and attaches hardware, such as caps, clamps, knobs, and switches, to assemblies<br>8) Performs intermediate assembly tasks, such as potting, encapsulating, sanding, cleaning, epoxy bonding, curing, stamping, etching, impregnating, and colour coding parts and assemblies<br>9) Tends machines that press, shape, or wind component parts<br>10) Adjusts or trims materials from components to achieve specified electrical or dimensional characteristics<br>11) Performs on-line go-not-go testing and inspection, using magnifying devices, measuring instruments, and electronic test equipment, to ensure parts and assemblies meet production specifications and standards<br>12) May perform assembly operations under microscope or other magnifying device<br>13) Occupations related to assembly of printed circuit boards and fabrication of integrated circuit chips are defined under separate definitions. | appropriate documentation when defects are identified<br>7) Rework and/or repair assembled equipment and products according to engineering specification changes<br>8) Perform all work in accordance with quality standards and established safety procedures<br>9) Maintain a clean and safe work area | accordance with drawings |

| AREA | **REPAIR OF FABRICATED METAL PRODUCTS (ELECTRONIC)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHANICAL)**<br>Responsibilities May Includes | **REPAIR OF FABRICATED METAL PRODUCTS (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 1 | N/A | N/A | N/A |

Table 4.5b: List of Responsibilities for Group 331 according to NOSS Levelling (3 of 16)

| AREA | **NON-AUTOMOTIVE ENGINES (ROTARY ENGINE)**<br>Responsibilities May Includes | **NON-AUTOMOTIVE ENGINES (STEAM ENGINE)**<br>Responsibilities May Includes | **NON-AUTOMOTIVE ENGINES (ROTARY VANE ENGINE)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 6 | **Rotary Engine Maintenance Specialist**<br>1) Diagnosis, Replace or Repair worn, defective, or damaged components, using hand tools, and power tools<br>2) Performs maintenance and keeps accurate Maintenance or repair log.<br>3) Inspect part and housing to verify conformity using micro meter, feeler gauges and dial indicators.<br>4) Inspects wiring harnesses for defects, rewires defective harnesses and connects terminals of harness wires as indicated, following schematics<br>5) Tests adjusts magnetos, using timing light.<br>6) Dips parts into cleaning tank of ultrasonic cleaning equipment to clean part surfaces, and hones cleaned parts to smooth finish, using hand files emery paper.<br>7) Inspect and Inserts or attaches and secured holding pins, seals, pipes and tubing, using measuring instruments hand tools or power tools.<br>8) Check and secured piping, attachments and connect test panel lines, starts engine and observes gauges to verify that the engine function according to specifications | **Steam Engine Maintenance Specialist**<br>1) Perform routine maintenance of Steam Engine and system, Replace or Repair defective valves, filters, steam trap or damaged components, using hand or power tools.<br>2) Performs maintenance and keeps accurate maintenance or repair log.<br>3) Troubleshooting of steam engine.<br>4) Responsible for the operation, and smooth running of steam engine and its auxiliary equipment.<br>5) Responsible in local regulatory requirements for all related equipment producing high pressure steam.<br>6) Complies with departmental policy and ensure safety and health procedures. | **Rotary Vane Maintenance Specialist**<br>1) Diagnosis, Replace or Repair worn, defective, or damaged components, using hand tools, and power tools<br>2) Performs maintenance and keeps accurate Maintenance or repair log.<br>3) Inspect part and housing to verify conformity using micro meter, feeler gauges and dial indicators.<br>4) Inspects wiring harnesses for defects, rewires defective harnesses and connects terminals of harness wires as indicated, following schematics<br>5) Tests adjusts magnetos, using timing light.<br>6) Dips parts into cleaning tank of ultrasonic cleaning equipment to clean part surfaces, and hones cleaned parts to smooth finish, using hand files emery paper.<br>7) Inspect and Inserts or attaches and secured holding pins, seals, pipes and tubing, using measuring instruments hand tools or power tools.<br>8) Check and secured piping, attachments and connect test panel lines, starts engine and observes gauges to verify that the engine function according to specifications |
| Level 5 | **Rotary Engine Maintenance Engineer**<br>1) Perform field vibration tests for existing or new equipment, and develop and implement machinery surveillance plans<br>2) Conduct machinery vibration analysis and | **Steam Engine Maintenance Engineer**<br>1) Perform on-site installation of systems and equipment and ongoing preventive maintenance, repair and calibration after installation | **Rotary Vane Maintenance Engineer**<br>1) Perform field vibration tests for existing or new equipment, and develop and implement machinery surveillance plans<br>2) Conduct machinery vibration analysis and |

| AREA | **NON-AUTOMOTIVE ENGINES (ROTARY ENGINE)**<br>Responsibilities May Includes | **NON-AUTOMOTIVE ENGINES (STEAM ENGINE)**<br>Responsibilities May Includes | **NON-AUTOMOTIVE ENGINES (ROTARY VANE ENGINE)**<br>Responsibilities May Includes |
|---|---|---|---|
| | supplied suggestions for our customers' proactive or predictive maintenance activities<br>3) Perform root cause failure analysis and recommend corrective actions to prevent catastrophic failures<br>4) Set up and maintain machinery databases for machinery vibration analysis programs<br>5) Plan major rotating equipment inspections and overhauls based on equipment reliability<br>6) Maintain daily runtime tracker and generated performance reports for key systems to highlight<br>7) Create performance test procedure<br>8) Verify Piping and Instrument Diagrams | 2) Respond to requests for emergency repairs and services to troublesome equipment<br>3) Provide technical instruction and assistance to customer representatives regarding installation, operation, calibration, repair and maintenance at customer's sites<br>4) Perform administrative functions such as: writing technical reports, ordering materials, securing quotations, preparing job status reports, reports to customers, time sheet and expense sheets on a complete timely, and thorough basis<br>5) Signs off on all changes implemented.<br>6) Drive customer satisfaction through commitment to quality.<br>7) Maintain strong safety mindset to assure the executed work reflects the technical requirements within GE safety standards<br>8) Knowledge to troubleshoot and provide routine maintenance checkout for wide range of equipment vintage<br>9) Prepare timely and accurate technical reports for customer records and a reference for future outages<br>10) Ensure all parts needed for the job are shipped to the site<br>11) Perform walk-downs during installation to ensure that the customer’s contractors are working properly.<br>12) Perform aftermarket upgrades that need to be performed at the site level. | supplied suggestions for our customers' proactive or predictive maintenance activities<br>3) Perform root cause failure analysis and recommend corrective actions to prevent catastrophic failures<br>4) Set up and maintain machinery databases for machinery vibration analysis programs<br>5) Plan major rotating equipment inspections and overhauls based on equipment reliability<br>6) Maintain daily runtime tracker and generated performance reports for key systems to highlight<br>7) Create performance test procedure<br>8) Verify Piping and Instrument Diagrams |

| AREA | **NON-AUTOMOTIVE ENGINES (ROTARY ENGINE)**<br>Responsibilities May Includes | **NON-AUTOMOTIVE ENGINES (STEAM ENGINE)**<br>Responsibilities May Includes | **NON-AUTOMOTIVE ENGINES (ROTARY VANE ENGINE)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 4 | **Rotary Engine Maintenance Assistant Engineer**<br>1) Assist in perform field vibration tests for existing or new equipment, and develop and implement machinery surveillance plans<br>2) Assist in conducting machinery vibration analysis and supplied suggestions for our customers' proactive or predictive maintenance activities<br>3) Assist in performing root cause failure analysis and recommend corrective actions to prevent catastrophic failures<br>4) Assist in set up and maintain machinery databases for machinery vibration analysis programs<br>5) Assist in planning major rotating equipment inspections and overhauls based on equipment reliability | **Steam Engine Maintenance Assistant Engineer**<br>1) Assist in performing on-site installation of systems and equipment and ongoing preventive maintenance, repair and calibration after installation<br>2) Respond to requests for emergency repairs and services to troublesome equipment<br>3) Assist in providing technical instruction and assistance to customer representatives regarding installation, operation, calibration, repair and maintenance at customer's sites<br>4) Perform administrative functions such as: writing technical reports, ordering materials, securing quotations, preparing job status reports, reports to customers, time sheet and expense sheets on a complete timely, and thorough basis<br>5) Drive customer satisfaction through commitment to quality.<br>6) Maintain strong safety mindset to assure the executed work reflects the technical requirements within GE safety standards<br>7) Knowledge to troubleshoot and provide routine maintenance checkout for wide range of equipment vintage<br>8) Assist in preparing technical reports for customer records and a reference for future outages<br>9) Ensure all parts needed for the job are shipped to the site<br>10) Assist in performing walk-downs during installation to ensure that the customer's contractors are working properly. | **Rotary Vane Maintenance Assistant Engineer**<br>1) Assist in perform field vibration tests for existing or new equipment, and develop and implement machinery surveillance plans<br>2) Assist in conducting machinery vibration analysis and supplied suggestions for our customers' proactive or predictive maintenance activities<br>3) Assist in performing root cause failure analysis and recommend corrective actions to prevent catastrophic failures<br>4) Assist in set up and maintain machinery databases for machinery vibration analysis programs<br>5) Assist in planning major rotating equipment inspections and overhauls based on equipment reliability |

| AREA | **NON-AUTOMOTIVE ENGINES (ROTARY ENGINE)**<br>Responsibilities May Includes | **NON-AUTOMOTIVE ENGINES (STEAM ENGINE)**<br>Responsibilities May Includes | **NON-AUTOMOTIVE ENGINES (ROTARY VANE ENGINE)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 3 | **Rotary Engine Maintenance Supervisor**<br>1) Supervise rotary engine systems troubleshooting<br>2) Supervise repairing and overhaul rotary engine systems<br>3) Check and supervise installation or modification rotary engines and mechanical, hydraulic, flight control, fuel and pneumatic systems<br>4) Dismantle airframes, rotary engines systems for repair, overhaul and cleaning, and reassemble<br>5) Check and document routine maintenance<br>6) Check order and maintain inventory of parts and supplies.<br>7) Check and supervise structural and mechanical systems of rotary engine and ensure that these systems meet company standards of performance and safety<br>8) Check maintenance, repair and overhaul, or modification of rotary engine systems to ensure adherence to standards and procedures<br>9) Check detailed repair, inspection and certification records and reports. | **Steam Engine Maintenance Supervisor**<br>1) Utilize blueprints and/or Manufacturing Instruction Letter (MIL) information to restore steam turbine rotating and stationary blading to design specification.<br>2) Prepare, position, align, and secure/clamp/brace parts or floor pieces to floor plates, work tables, turning rolls as needed.<br>3) Set up, adjust, and operate various machines according to job needs.<br>4) Set up and operate hand equipment for chipping, grinding, wire brushing, etching, sawing as needed.<br>5) Perform and document experimental weld tests on welding wires, fluxes, machines, and materials.<br>6) Monitor, regulate, and document proper speed, heat, and other variables during weld operations.<br>7) Detect, diagnose, and make necessary corrections to operation malfunctions.<br>8) Check for leaks on gas lines, connections, and correct welding line pressure.<br>9) Communicate and counsel peers in their welding/machining work.<br>10) Perform daily and regular cleaning and light maintenance tasks on machinery and equipment as needed.<br>11) Evaluate experimental procedures and recommend change or modifications for efficiency and adaptability to setup and production. | **Rotary Vane Maintenance Supervisor**<br>1) Supervise rotary engine systems troubleshooting<br>2) Supervise repairing and overhaul rotary engine systems<br>3) Check and supervise installation or modification rotary engines and mechanical, hydraulic, flight control, fuel and pneumatic systems<br>4) Dismantle airframes, rotary engines systems for repair, overhaul and cleaning, and reassemble<br>5) Check and document routine maintenance<br>6) Check order and maintain inventory of parts and supplies.<br>7) Check and supervise structural and mechanical systems of rotary engine and ensure that these systems meet company standards of performance and safety<br>8) Check maintenance, repair and overhaul, or modification of rotary engine systems to ensure adherence to standards and procedures<br>9) Check detailed repair, inspection and certification records and reports. |

| AREA | **NON-AUTOMOTIVE ENGINES (ROTARY ENGINE)**<br>Responsibilities May Includes | **NON-AUTOMOTIVE ENGINES (STEAM ENGINE)**<br>Responsibilities May Includes | **NON-AUTOMOTIVE ENGINES (ROTARY VANE ENGINE)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 2 | **Rotary Engine Maintenance Technician**<br>1) Troubleshoot rotary engine systems to identify problems and adjust and repair systems according to specifications, technical drawings, manuals and established procedures<br>2) Repair and overhaul rotary engine systems<br>3) Install or modify rotary engines and mechanical, hydraulic, flight control, fuel and pneumatic systems<br>4) Dismantle airframes, rotary engines systems for repair, overhaul and cleaning, and reassemble<br>5) Perform and document routine maintenance<br>6) Order and maintain inventory of parts and supplies.<br>7) Rotary technician usually specialise in working on specific aircraft systems such as engines, engine accessories, airframes, propellers, mechanical components or hydraulic systems and specific kinds of aircraft, such as light aircraft, jet transports and helicopters.<br>8) Inspect structural and mechanical systems of rotary engine and ensure that these systems meet company standards of performance and safety<br>9) Performing maintenance, repair and overhaul, or modification of rotary engine systems to ensure adherence to standards and procedures<br>10) Maintain detailed repair, inspection and certification records and reports. | **Steam Engine Maintenance Technician**<br>1) Utilize blueprints and/or Manufacturing Instruction Letter (MIL) information to restore steam turbine rotating and stationary blading to design specification.<br>2) Prepare, position, align, and secure/clamp/brace parts or floor pieces to floor plates, work tables, turning rolls as needed.<br>3) Set up, adjust, and operate various machines according to job needs.<br>4) Set up and operate hand equipment for chipping, grinding, wire brushing, etching, sawing as needed.<br>5) Perform and document experimental weld tests on welding wires, fluxes, machines, and materials.<br>6) Detect, diagnose, and make necessary corrections to operation malfunctions.<br>7) Check for leaks on gas lines, connections, and correct welding line pressure.<br>8) Communicate and counsel peers in their welding/machining work.<br>9) Perform daily and regular cleaning and light maintenance tasks on machinery and equipment as needed. | **Rotary Vane Maintenance Technician**<br>1) Troubleshoot rotary engine systems to identify problems and adjust and repair systems according to specifications, technical drawings, manuals and established procedures<br>2) Repair and overhaul rotary engine systems<br>3) Install or modify rotary engines and mechanical, hydraulic, flight control, fuel and pneumatic systems<br>4) Dismantle airframes, rotary engines systems for repair, overhaul and cleaning, and reassemble<br>5) Perform and document routine maintenance<br>6) Order and maintain inventory of parts and supplies.<br>7) Rotary technician usually specialise in working on specific aircraft systems such as engines, engine accessories, airframes, propellers, mechanical components or hydraulic systems and specific kinds of aircraft, such as light aircraft, jet transports and helicopters.<br>8) Inspect structural and mechanical systems of rotary engine and ensure that these systems meet company standards of performance and safety<br>9) Performing maintenance, repair and overhaul, or modification of rotary engine systems to ensure adherence to standards and procedures<br>10) Maintain detailed repair, inspection and certification records and reports. |

| AREA | **NON-AUTOMOTIVE ENGINES (ROTARY ENGINE)**<br>Responsibilities May Includes | **NON-AUTOMOTIVE ENGINES (STEAM ENGINE)**<br>Responsibilities May Includes | **NON-AUTOMOTIVE ENGINES (ROTARY VANE ENGINE)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 1 | N/A | N/A | N/A |

Table 4.5c: List of Responsibilities for Group 331 according to NOSS Levelling (4 of 16)

| AREA | **NON-AUTOMOTIVE ENGINES (GAS ENGINE)** Responsibilities May Includes | **HEATING, VENTILATION & AIR CONDITIONING (HVAC)** Responsibilities May Includes | **AIR CONDITIONING & MECHANICAL VENTILATION (ACMV)** Responsibilities May Includes |
|---|---|---|---|
| Level 6 | **Gas Engine Maintenance Specialist**<br>1) Perform routine maintenance of gas engine and system, replace or repair defective valves, filters, steam trap or damaged components, using hand or power tools.<br>2) Performs maintenance and keeps accurate maintenance or repair log.<br>3) Troubleshooting of gas engine.<br>4) Responsible for the operation, and smooth running of gas engine and its auxiliary equipment.<br>5) Responsible in local regulatory requirements for all related equipment producing high pressure gas.<br>6) Complies with departmental policy and ensure safety and health procedures. | N/A | N/A |
| Level 5 | **Gas Engine Maintenance Engineer**<br>1) Perform on-site installation of systems and equipment and ongoing preventive maintenance, repair and calibration after installation<br>2) Respond to requests for emergency repairs and services to troublesome equipment<br>3) Provide technical instruction and assistance to customer representatives regarding installation, operation, calibration, repair and maintenance at customer's sites<br>4) Perform administrative functions such as: writing technical reports, ordering materials, securing quotations, preparing job status reports, reports to customers, time sheet and | **HVAC Installation & Maintenance Engineer**<br>1) Research, design, fabricate, and install HVAC mechanical equipment to meet client's requirements in both large and small projects.<br>2) Consult on HVAC system and equipment design for a wide range of projects, and work with other engineers, project managers, and construction professionals as needed to create and/or modify design parameters.<br>3) Develop and oversee all aspects of production including Clean Room design, computer modelling, selection of manufacturing methods, fabrication, testing, and implementation of products and systems.<br>4) Analyse HVAC systems and equipment when | **ACMV Installation & Maintenance Engineer**<br>1) Research, design, fabricate, and install ACMV mechanical equipment to meet client's requirements in both large and small projects.<br>2) Consult on ACMV system and equipment design for a wide range of projects, and work with other engineers, project managers, and construction professionals as needed to create and/or modify design parameters.<br>3) Develop and oversee all aspects of production including Clean Room design, computer modelling, selection of manufacturing methods, fabrication, testing, and implementation of products and systems.<br>4) Analyse ACMV systems and equipment when |

| AREA | **NON-AUTOMOTIVE ENGINES (GAS ENGINE)** Responsibilities May Includes | **HEATING, VENTILATION & AIR CONDITIONING (HVAC)** Responsibilities May Includes | **AIR CONDITIONING & MECHANICAL VENTILATION (ACMV)** Responsibilities May Includes |
|---|---|---|---|
| | expense sheets on a complete timely, and thorough basis<br>5) Signs off on all changes implemented.<br>6) Drive customer satisfaction through commitment to quality.<br>7) Maintain strong safety mindset to assure the executed work reflects the technical requirements within GE safety standards<br>8) Knowledge to troubleshoot and provide routine maintenance checkout for wide range of equipment vintage<br>9) Prepare timely and accurate technical reports for customer records and a reference for future outages<br>10) Ensure all parts needed for the job are shipped to the site<br>11) Perform walk-downs during installation to ensure that the customer's contractors are working properly.<br>12) Perform aftermarket upgrades that need to be performed at the site level. | necessary to find inefficiencies or malfunctions and create solutions to optimize performance and increase the efficiency of operation.<br>5) Design testing procedures and control equipment to accurately assess products and identify areas that require modification and further testing.<br>6) Communicate directly with customers to understand project requirements, goals, design specifications, and operational environments in order to evaluate cost, feasibility, and implementation of new HVAC equipment.<br>7) Create and submit detailed bids that outline costs and timelines for construction or extraction projects in accordance with deadlines.<br>8) Serve as project leader to coordinate efforts of managers, engineers, drafters, and manufacturing personnel during all project phases. | necessary to find inefficiencies or malfunctions and create solutions to optimize performance and increase the efficiency of operation.<br>5) Design testing procedures and control equipment to accurately assess products and identify areas that require modification and further testing.<br>6) Communicate directly with customers to understand project requirements, goals, design specifications, and operational environments in order to evaluate cost, feasibility, and implementation of new ACMV equipment.<br>7) Create and submit detailed bids that outline costs and timelines for construction or extraction projects in accordance with deadlines.<br>8) Serve as project leader to coordinate efforts of managers, engineers, drafters, and manufacturing personnel during all project phases. |
| Level 4 | **Gas Engine Maintenance Assistant Engineer**<br>1) Assist in performing on-site installation of systems and equipment and ongoing preventive maintenance, repair and calibration after installation<br>2) Respond to requests for emergency repairs and services to troublesome equipment<br>3) Assist in providing technical instruction and assistance to customer representatives regarding installation, operation, calibration, | **HVAC Installation & Maintenance Assistant Engineer**<br>1) Assist in research, design, fabricate, and install HVAC mechanical equipment to meet client's requirements in both large and small projects.<br>2) Consult on HVAC system and equipment design for a wide range of projects, and work with other engineers, project managers, and construction professionals as needed to | **ACMV Installation & Maintenance Assistant Engineer**<br>1) Assist in research, design, fabricate, and install ACMV mechanical equipment to meet client's requirements in both large and small projects.<br>2) Consult on ACMV system and equipment design for a wide range of projects, and work with other engineers, project managers, and construction professionals as needed to |

| AREA | **NON-AUTOMOTIVE ENGINES (GAS ENGINE)** Responsibilities May Includes | **HEATING, VENTILATION & AIR CONDITIONING (HVAC)** Responsibilities May Includes | **AIR CONDITIONING & MECHANICAL VENTILATION (ACMV)** Responsibilities May Includes |
|---|---|---|---|
| | repair and maintenance at customer's sites<br>4) Perform administrative functions such as: writing technical reports, ordering materials, securing quotations, preparing job status reports, reports to customers, time sheet and expense sheets on a complete timely, and thorough basis<br>5) Drive customer satisfaction through commitment to quality.<br>6) Maintain strong safety mindset to assure the executed work reflects the technical requirements within GE safety standards<br>7) Knowledge to troubleshoot and provide routine maintenance checkout for wide range of equipment vintage<br>8) Assist in preparing technical reports for customer records and a reference for future outages<br>9) Ensure all parts needed for the job are shipped to the site<br>10) Assist in performing walk-downs during installation to ensure that the customer's contractors are working properly. | create and/or modify design parameters.<br>3) Assist in develop and oversee all aspects of production including Clean Room design, computer modelling, selection of manufacturing methods, fabrication, testing, and implementation of products and systems.<br>4) Analyse HVAC systems and equipment when necessary to find inefficiencies or malfunctions and create solutions to optimize performance and increase the efficiency of operation.<br>5) Design testing procedures and control equipment to accurately assess products and identify areas that require modification and further testing.<br>6) Communicate directly with customers to understand project requirements, goals, design specifications, and operational environments in order to evaluate cost, feasibility, and implementation of new HVAC equipment.<br>7) Assist in preparing detailed bids that outline costs and timelines for construction or extraction projects in accordance with deadlines. | create and/or modify design parameters.<br>3) Assist in develop and oversee all aspects of production including Clean Room design, computer modelling, selection of manufacturing methods, fabrication, testing, and implementation of products and systems.<br>4) Analyse ACMV systems and equipment when necessary to find inefficiencies or malfunctions and create solutions to optimize performance and increase the efficiency of operation.<br>5) Design testing procedures and control equipment to accurately assess products and identify areas that require modification and further testing.<br>6) Communicate directly with customers to understand project requirements, goals, design specifications, and operational environments in order to evaluate cost, feasibility, and implementation of new ACMV equipment.<br>7) Assist in preparing detailed bids that outline costs and timelines for construction or extraction projects in accordance with deadlines. |
| Level 3 | **Gas Engine Maintenance Supervisor**<br>1) Prepare, position, align, and secure/clamp/brace parts or floor pieces to floor plates, work tables, turning rolls as needed.<br>2) Set up, adjust, and operate various machines according to job needs. | **HVAC Installation & Maintenance Supervisor**<br>1) Prepares material and labour estimates.<br>2) Prepares sketches of proposed work and assists in the design and specifications of planned jobs or contracts.<br>3) Establishes, assigns, and adjusts work methods and procedures to meet schedules | **ACM Installation & Maintenance Supervisor**<br>1) Prepares material and labour estimates.<br>2) Prepares sketches of proposed work and assists in the design and specifications of planned jobs or contracts.<br>3) Establishes, assigns, and adjusts work methods and procedures to meet schedules |

| AREA | **NON-AUTOMOTIVE ENGINES (GAS ENGINE)**<br>Responsibilities May Includes | **HEATING, VENTILATION & AIR CONDITIONING (HVAC)**<br>Responsibilities May Includes | **AIR CONDITIONING & MECHANICAL VENTILATION (ACMV)**<br>Responsibilities May Includes |
|---|---|---|---|
| | 3) Set up and operate hand equipment for chipping, grinding, wire brushing, etching, sawing as needed.<br>4) Perform and document experimental weld tests on welding wires, fluxes, machines, and materials.<br>5) Monitor, regulate, and document proper speed, heat, and other variables during weld operations.<br>6) Detect, diagnose, and make necessary corrections to operation malfunctions.<br>7) Check for leaks on gas lines, connections, and correct welding line pressure.<br>8) Communicate and counsel peers in their welding/machining work.<br>9) Perform daily and regular cleaning and light maintenance tasks on machinery and equipment as needed.<br>10) Evaluate experimental procedures and recommend change or modifications for efficiency and adaptability to setup and production. | using knowledge of capacities and capabilities of personnel and equipment.<br>4) Initiates measures to improve methods, equipment performance, and quality of work.<br>5) Ensures budgeting guidelines are met; prioritizes expenditures to stay within budget; assists in the preparation of capital and operations budgets.<br>6) Interprets policies to assigned personnel and enforces safety regulations and adherence to proper codes and standards.<br>7) Recommends or initiates action involving promotions, transfers, disciplinary action, and motivation of employees.<br>8) Maintains records and files, including the approval of time cards and absences, and submits as required.<br>9) Trains and instructs employees in new methods or procedures.<br>10) Maintains responsibility for the correct stock levels of repair or replacement parts.<br>11) Inspects work in process to insure its completion within allotted time limits and for acceptable quality standards.<br>12) Coordinates with suppliers, contractors, engineers, and others concerning equipment operations or maintenance. | using knowledge of capacities and capabilities of personnel and equipment.<br>4) Initiates measures to improve methods, equipment performance, and quality of work.<br>5) Ensures budgeting guidelines are met; prioritizes expenditures to stay within budget; assists in the preparation of capital and operations budgets.<br>6) Interprets policies to assigned personnel and enforces safety regulations and adherence to proper codes and standards.<br>7) Recommends or initiates action involving promotions, transfers, disciplinary action, and motivation of employees.<br>8) Maintains records and files, including the approval of time cards and absences, and submits as required.<br>9) Trains and instructs employees in new methods or procedures.<br>10) Maintains responsibility for the correct stock levels of repair or replacement parts.<br>11) Inspects work in process to insure its completion within allotted time limits and for acceptable quality standards.<br>12) Coordinates with suppliers, contractors, engineers, and others concerning equipment operations or maintenance. |
| Level 2 | **Gas Engine Maintenance Technician**<br>1) Prepare, position, align, and secure/clamp/brace parts or floor pieces to floor plates, work tables, turning rolls as needed. | **HVAC Installation & Maintenance Technician**<br>1) Perform routine maintenance of gas engine and system, replace or repair defective valves, filters, steam trap or damaged components, using hand or power tools. | **ACMV Installation & Maintenance Technician**<br>1) Perform routine maintenance of gas engine and system, replace or repair defective valves, filters, steam trap or damaged components, using hand or power tools. |

| AREA | **NON-AUTOMOTIVE ENGINES (GAS ENGINE)**<br>Responsibilities May Includes | **HEATING, VENTILATION & AIR CONDITIONING (HVAC)**<br>Responsibilities May Includes | **AIR CONDITIONING & MECHANICAL VENTILATION (ACMV)**<br>Responsibilities May Includes |
|---|---|---|---|
| | 2) Set up, adjust, and operate various machines according to job needs.<br>3) Set up and operate hand equipment for chipping, grinding, wire brushing, etching, sawing as needed.<br>4) Perform and document experimental weld tests on welding wires, fluxes, machines, and materials.<br>5) Detect, diagnose, and make necessary corrections to operation malfunctions.<br>6) Check for leaks on gas lines, connections, and correct welding line pressure.<br>7) Communicate and counsel peers in their welding/machining work.<br>8) Perform daily and regular cleaning and light maintenance tasks on machinery and equipment as needed. | 2) Diagnose and repair malfunctions in various types of heating and air-conditioning systems, including rooftop equipment.<br>3) Install new heating and air conditioning systems and components.<br>4) Relocate and expand existing HVAC systems as needed.<br>5) Repair, replace, or calibrate controls, thermostats, switches, fuses, and electrical wiring.<br>6) Fabricate, assemble, and install duct work and piping according to specifications and code.<br>7) Wire and connect motors, compressors, temperature controls, and humidity controls according to wiring schematics.<br>8) Maintain preventive maintenance schedules and procedures for all HVAC equipment, including changing of filters and cleaning condensers and coils.<br>9) Perform duct cleaning and air quality testing as needed.<br>10) Assist energy manager to complete energy conservation surveys to realize most efficient, cost effective use of HVAC energy.<br>11) Select material and hardware and make time and materials estimates.<br>12) Maintain accurate records on material and labor used.<br>13) Maintain inventory of district-owned tools, equipment, and materials.<br>14) Inspect jobs upon completion and ensure areas are clean. | 2) Diagnose and repair malfunctions in various types of cooling and air-conditioning systems, including rooftop equipment.<br>3) Install new cooling and air conditioning systems and components.<br>4) Relocate and expand existing ACMV systems as needed.<br>5) Repair, replace, or calibrate controls, thermostats, switches, fuses, and electrical wiring.<br>6) Fabricate, assemble, and install duct work and piping according to specifications and code.<br>7) Wire and connect motors, compressors, temperature controls, and humidity controls according to wiring schematics.<br>8) Maintain preventive maintenance schedules and procedures for all ACMV equipment, including changing of filters and cleaning condensers and coils.<br>9) Perform duct cleaning and air quality testing as needed.<br>10) Assist energy manager to complete energy conservation surveys to realize most efficient, cost effective use of ACMV energy.<br>11) Select material and hardware and make time and materials estimates.<br>12) Maintain accurate records on material and labour used.<br>13) Maintain inventory of district-owned tools, equipment, and materials.<br>14) Inspect jobs upon completion and ensure areas are clean. |

| AREA | **NON-AUTOMOTIVE ENGINES (GAS ENGINE)** Responsibilities May Includes | **HEATING, VENTILATION & AIR CONDITIONING (HVAC)** Responsibilities May Includes | **AIR CONDITIONING & MECHANICAL VENTILATION (ACMV)** Responsibilities May Includes |
|---|---|---|---|
| | | 15) Work with building principals and supervisors to complete projects.<br>16) Detect needed repairs on equipment following established inspection procedures. | 15) Work with building principals and supervisors to complete projects.<br>16) Detect needed repairs on equipment following established inspection procedures. |
| Level 1 | N/A | N/A | N/A |

Table 4.5d: List of Responsibilities for Group 331 according to NOSS Levelling (5 of 16)

| AREA | **HEAVY MACHINERY MAINTENANCE**<br>Responsibilities May Includes | **WEAPON TECHNOLOGY & MANAGEMENT**<br>Responsibilities May Includes | **AMMUNITION & EXPLOSIVE MANAGEMENT**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 6 | **Heavy Machinery Maintenance Specialist**<br>1) Handles heavy equipment damage assignments<br>2) Writes or reviews estimates on heavy equipment losses, arranges repairs and negotiates repair costs with repair shops.<br>3) Negotiates equipment down time claims.<br>4) Establishes value and settles total losses, disposes of salvage and keeps related records.<br>5) Distinguishes cause of damage for appropriate policy coverages.<br>6) Checks coverage on all losses.<br>7) Issues settlement checks and keeps appropriate records.<br>8) Contacts Policyholders and claimants regarding complaints stemming from original adjustment.<br>9) Serves as a consultant to the branch offices on heavy equipment losses. | N/A | N/A |

| AREA | **HEAVY MACHINERY MAINTENANCE**<br>Responsibilities May Includes | **WEAPON TECHNOLOGY & MANAGEMENT**<br>Responsibilities May Includes | **AMMUNITION & EXPLOSIVE MANAGEMENT**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 5 | **Heavy Machinery Maintenance Engineer**<br>1) Assessing project requirements<br>2) Measuring the performance of mechanical components, devices and engines<br>3) Agreeing budgets, timescales and specifications with clients and managers<br>4) Maintaining and modifying equipment to ensure that it is safe, reliable and efficient<br>5) Using computer-aided design/modelling software<br>6) Liaising with suppliers<br>7) Undertaking relevant research<br>8) Producing and implementing designs and test procedures<br>9) Presenting designs to managers and clients<br>10) Testing, evaluating, modifying and re-testing products<br>11) Writing reports and documentation<br>12) Providing technical advice<br>13) Analysing and interpreting data.<br>14) Diagnosing faults and responding to breakdowns<br>15) Supervising engineering and technical staff<br>16) Obtaining specialist components, fixtures or fittings<br>17) Managing budgets, maintaining statistical and financial records<br>18) Ensuring compliance with health and safety legislation<br>19) Creating maintenance procedures<br>20) Managing stocks of supplies and equipment. | **Senior Armament Officer**<br>1) Analyse data and use it to create reports on industry trends, which are then submitted to managers and used to develop business plans.<br>2) Maintain good relationships with customers and clients and develop new relationships when the opportunities present themselves.<br>3) Organise and attend client meetings as well as meetings for internal staff.<br>4) Create and maintain a variety of documents<br>5) Facilitate good communication between and provide leadership for teams working on a project, including the marketing, research and development, and testing teams.<br>6) Report project details and progress to the appropriate manager on a regular basis.<br>7) Track project schedules<br>8) Set specific goals for projects | **Ammo & Explosive Senior Executive**<br>1) Analyse data and use it to create reports on industry trends, which are then submitted to managers and used to develop business plans.<br>2) Maintain good relationships with customers and clients and develop new relationships when the opportunities present themselves.<br>3) Organise and attend client meetings as well as meetings for internal staff.<br>4) Create and maintain a variety of documents<br>5) Facilitate good communication between and provide leadership for teams working on a project, including the marketing, research and development, and testing teams.<br>6) Report project details and progress to the appropriate manager on a regular basis.<br>7) Track project schedules<br>8) Set specific goals for projects |

| AREA | **HEAVY MACHINERY MAINTENANCE**<br>Responsibilities May Includes | **WEAPON TECHNOLOGY & MANAGEMENT**<br>Responsibilities May Includes | **AMMUNITION & EXPLOSIVE MANAGEMENT**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 4 | **Heavy Machinery Maintenance Assistant Engineer**<br>1) Prepare project requirements<br>2) Assist in preparing budgets, timescales and specifications with clients and managers<br>3) Maintaining and modifying equipment to ensure that it is safe, reliable and efficient<br>4) Using computer-aided design/modelling software<br>5) Liaising with suppliers<br>6) Provide inputs for designs and test procedures<br>7) Presenting designs to managers and clients<br>8) Testing, evaluating, modifying and re-testing products<br>9) Writing reports and documentation<br>10) Diagnosing faults and responding to breakdowns<br>11) Obtaining specialist components, fixtures or fittings<br>12) Ensuring compliance with health and safety legislation<br>13) Coordinate stocks of supplies and equipment. | **Armament Officer**<br>1) Repairs and adjusts hydraulic and mechanical systems; adjusts breech and firing mechanisms; services recoil mechanisms. Applies diagnostic and troubleshooting techniques to determine cause(s) of malfunctions<br>2) Repairs turret electronic systems.<br>3) Identifies and submits required documents for repair part(s) requests.<br>4) Maintains records, prepares and submits required reports, possibly interfacing often with the Production Control Section.<br>5) Monitors, assigns and supervises Section workflow under the direction of the Armament Section Chief.<br>6) Able to operate Direct Support and General Support specific test and diagnostic equipment related to electronic components.<br>7) Trouble shoots and repairs equipment, such as Direct Support Electrical Systems Test Sets, General Purpose Interface Assemblies, and Specialized Test Equipment.<br>8) Performs other duties as required. | **Ammo & Explosive Executive**<br>1) Repairs and adjusts hydraulic and mechanical systems; adjusts breech and firing mechanisms; services recoil mechanisms. Applies diagnostic and troubleshooting techniques to determine cause(s) of malfunctions<br>2) Repairs turret electronic systems.<br>3) Identifies and submits required documents for repair part(s) requests.<br>4) Maintains records, prepares and submits required reports, possibly interfacing often with the Production Control Section.<br>5) Monitors, assigns and supervises Section workflow under the direction of the Armament Section Chief.<br>6) Able to operate Direct Support and General Support specific test and diagnostic equipment related to electronic components.<br>7) Trouble shoots and repairs equipment, such as Direct Support Electrical Systems Test Sets, General Purpose Interface Assemblies, and Specialized Test Equipment.<br>**8)** Performs other duties as required. |
| Level 3 | **Heavy Machinery Maintenance Supervisor**<br>1) Supervise scheduled maintenance<br>2) Supervise vehicle diagnoses using computer systems or manuals.<br>3) Check engines repairs, transmissions, brake systems, electrical systems, air conditioning, fuel systems, computer systems, emissions systems, front or rear ends and components, and performs wheel alignments. | **Senior Armourer**<br>1) Specializes in restoring and preparing exhibits of medieval arms and armour<br>2) Check assembles parts of armour, helmets, guns, swords, and similar items.<br>3) Check Designs and fabricates missing or broken parts.<br>4) Conducts research to determine authenticity and classifies and catalogues articles. | **Ammo & Explosive Supervisor**<br>1) Ensure that ordnance movements are completed on schedule and per regulations.<br>2) Ensure that ordnance requisitions are fulfilled as directed.<br>3) Maintain inventory management records.<br>4) Ensure processing of transactions involving ordnance.<br>5) Maintain stockage levels, conduct location |

| AREA | **HEAVY MACHINERY MAINTENANCE**<br>Responsibilities May Includes | **WEAPON TECHNOLOGY & MANAGEMENT**<br>Responsibilities May Includes | **AMMUNITION & EXPLOSIVE MANAGEMENT**<br>Responsibilities May Includes |
|---|---|---|---|
| | 4) Supervise service records for work performed<br>5) Check purchase orders and issues parts, supplies, tools, and equipment as necessary.<br>6) Makes recommendations for repair, modification, and disposal of equipment, tools, and vehicles.<br>7) Maintains and repairs equipment related to fuel delivery and sites to ensure a clean and safe environment. | 5) Check new or seized firearms testing.<br>6) Check reloads ammunition for firearms training.<br>7) Supervise records and weapon inventory.<br>8) Supervise repairs to reloading equipment and firearms.<br>9) Provides expert court evidence relating to firearms expertise. | reconciliation, update and reconcile the Ordnance Information System (OIS), create requisitions and process NARs (Notice of Ammunition Reclassification |
| Level 2 | **Heavy Machinery Maintenance Mechanic**<br>1) Inspects, diagnoses, services, repairs and performs scheduled maintenance<br>2) Performs complex diagnoses of vehicles using computer systems or manuals.<br>3) Repairs engines, transmissions, brake systems, electrical systems, air conditioning, fuel systems, computer systems, emissions systems, front or rear ends and components, and performs wheel alignments.<br>4) Performs other vehicular mechanical repairs as necessary.<br>5) Maintains emergency vehicle's<br>6) Completes service records for work performed, including documenting labour and parts used.<br>7) Initiates purchase orders and issues parts, supplies, tools, and equipment as necessary.<br>8) Responds to emergency road assistance calls for disable city vehicles and equipment.<br>9) Makes recommendations for repair, modification, and disposal of equipment, tools, and vehicles.<br>10) Use a wide variety of test equipment. | **Armourer**<br>1) Specializes in restoring and preparing exhibits of medieval arms and armour<br>2) Assembles parts of armour, helmets, guns, swords, and similar items.<br>3) Designs and fabricates missing or broken parts.<br>4) Conducts research to determine authenticity and classifies and catalogues articles.<br>5) Prepares articles for exhibition.<br>6) Inspects and tests new or seized firearms.<br>7) Reloads ammunition for firearms training.<br>8) Maintains records and weapon inventory.<br>9) Performs repairs to reloading equipment and firearms.<br>10) Provides expert court evidence relating to firearms expertise. | **Ammo & Explosive Technician**<br>1) Provide advice on all ammunition and explosive safety matters<br>2) Manage the storage of ammunition and explosives<br>3) Prepare and ship ammunition and explosives<br>4) Maintain static facilities, field and deployed installations<br>5) Perform render safe and disposal procedures on explosive ordnances<br>6) Certify ammunition, explosive items, munitions and non-munitions scrap to different degrees of classification<br>7) Conduct improvised explosive devices disposal operations<br>**8)** Operate equipment in support of operations |

| AREA | **HEAVY MACHINERY MAINTENANCE** Responsibilities May Includes | **WEAPON TECHNOLOGY & MANAGEMENT** Responsibilities May Includes | **AMMUNITION & EXPLOSIVE MANAGEMENT** Responsibilities May Includes |
|---|---|---|---|
| | 11) Maintains and repairs equipment related to fuel delivery and sites to ensure a clean and safe environment. | | |
| Level 1 | N/A | N/A | N/A |

Table 4.5e: List of Responsibilities for Group 331 according to NOSS Levelling (6 of 16)

| AREA | **ELECTRONIC AND OPTICAL EQUIPMENT**<br>Responsibilities May Includes | **AIRCRAFT ENGINE INSTRUMENTS**<br>Responsibilities May Includes | **AUTOMOTIVE EMISSIONS TESTING EQUIPMENT**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 5 | N/A | **Aircraft Instrumentation and Control Engineer**<br>1) Designing and developing new control systems<br>2) Testing, maintaining and modifying existing systems<br>3) Analysing data and presenting findings in written reports<br>4) Managing operations<br>5) Working collaboratively with design engineers, operation engineers, purchasers and other internal staff<br>6) Liaising with clients, suppliers, contractors and relevant authorities<br>7) Project management within cost and time constrained environments<br>8) Understanding and ensuring compliance with relevant health and safety regulations and quality standards<br>9) Providing advice and consultancy support<br>10) Purchasing equipment<br>11) Writing computer software and test procedures<br>12) Developing new business proposals. | **Automotive Instrumentation Measurement Engineer**<br>1) Develop engineering specifications or cost estimates for automotive design concepts<br>2) Calibrate vehicle systems, including control algorithms or other software systems<br>3) Develop calibration methodologies, test methodologies, or tools.<br>4) Build models for algorithm or control feature verification testing.<br>5) Alter or modify designs to obtain specified functional or operational performance.<br>6) Conduct or direct system-level automotive testing.<br>7) Develop specifications for vehicles powered by alternative fuels or alternative power methods.<br>8) Write, review, or maintain engineering documentation<br>9) Conduct automotive design reviews.<br>10) Conduct research studies to develop new concepts in the field of automotive engineering.<br>11) Provide technical direction to other engineers or engineering support personnel<br>12) Perform failure, variation, or root cause analyses.<br>13) Coordinate production activities with other functional units, such as procurement, maintenance, or quality control.<br>14) Design or analyse automobile systems in areas such as aerodynamics, alternate fuels, |

| AREA | **ELECTRONIC AND OPTICAL EQUIPMENT**<br>Responsibilities May Includes | **AIRCRAFT ENGINE INSTRUMENTS**<br>Responsibilities May Includes | **AUTOMOTIVE EMISSIONS TESTING EQUIPMENT**<br>Responsibilities May Includes |
|---|---|---|---|
| | | | ergonomics, hybrid power, brakes, transmissions, steering, calibration, safety, or diagnostics.<br>15) Design control systems or algorithms for purposes such as automotive energy management, emissions management, or increased operational safety or performance.<br>16) Create design alternatives for vehicle components, such as camless or dual-clutch engines or alternative air-conditioning systems, to increase fuel efficiency.<br>17) Design vehicles for increased recyclability or use of natural, renewable, or recycled materials in vehicle construction<br>18) Design vehicles that use lighter materials, such as aluminium, magnesium alloy, or plastic, to improve fuel efficiency.<br>19) Research computerized automotive applications, such as telemetric, intelligent transportation systems, artificial intelligence, or automatic control.<br>20) Research or implement green automotive technologies involving alternative fuels, electric or hybrid cars, or lighter or more fuel-efficient vehicles |
| Level 4 | N/A | **Aircraft Instrumentation and Control Assistant Engineer**<br>1) Instrumentation installation for tested components and test rigs<br>2) Working with technical documentation including P&ID diagrams, electrical wiring diagrams, operation and maintenance | **Automotive Instrumentation Measurement Assistant Engineer**<br>1) Prepare engineering specifications or cost estimates for automotive design concepts<br>2) Calibrate vehicle systems, including control algorithms or other software systems<br>3) Prepare calibration methodologies, test |

| AREA | **ELECTRONIC AND OPTICAL EQUIPMENT**<br>Responsibilities May Includes | **AIRCRAFT ENGINE INSTRUMENTS**<br>Responsibilities May Includes | **AUTOMOTIVE EMISSIONS TESTING EQUIPMENT**<br>Responsibilities May Includes |
|---|---|---|---|
| | | manuals and other<br>3) Test rig modifications concerning automation actuators for hydraulics, pneumatics and mechanics including preparation of technical documentation revisions<br>4) Control and electrical cabinets operation and service<br>5) Control system adaptation for new instrumentation and current actuator settings<br>6) Test rig operation in service, manual and automatic control modes<br>7) Preparation of selected data for presentation<br>8) Keeping all instrumentation, actuators and control equipment in good technical condition including proper handling, installation, service and periodic calibration | methodologies, or tools.<br>4) Assist in build models for algorithm or control feature verification testing.<br>5) Assist in conducting or direct system-level automotive testing.<br>6) Assist in developing specifications for vehicles powered by alternative fuels or alternative power methods.<br>7) Assist in conduct automotive design reviews.<br>8) Assist in conduct research studies to develop new concepts in the field of automotive engineering.<br>9) Check failure, variation, or root cause analyses.<br>10) Coordinate production activities with other functional units, such as procurement, maintenance, or quality control.<br>11) Assist in designing or analysing automobile systems in areas such as aerodynamics, alternate fuels, ergonomics, hybrid power, brakes, transmissions, steering, calibration, safety, or diagnostics.<br>12) Assist in design control systems or algorithms |
| Level 3 | **Electronic Maintenance Supervisor**<br>1) Adjust cameras, photographic mechanisms, or equipment such as range and view finders, shutters, light meters, or lens systems, using hand tools.<br>2) Disassemble equipment to gain access to defect, using hand tools | **Aircraft Instrumentation and Control Supervisor**<br>1) Perform duties as A&P mechanic<br>2) Perform duties as aircraft instrumentation flight crew member, as required.<br>3) Proficient in AutoCAD and/or Unigraphics.<br>4) Read and interpret blue prints, engineering drawing and technical publications. | **Automotive Instrumentation Measurement Supervisor**<br>1) Plans, schedules and assigns repair and maintenance jobs<br>2) Advises and assists subordinates on major repair problems and difficult diagnostic tasks.<br>3) Diagnoses, through road tests or otherwise, |

| AREA | **ELECTRONIC AND OPTICAL EQUIPMENT**<br>Responsibilities May Includes | **AIRCRAFT ENGINE INSTRUMENTS**<br>Responsibilities May Includes | **AUTOMOTIVE EMISSIONS TESTING EQUIPMENT**<br>Responsibilities May Includes |
|---|---|---|---|
| | 3) Test equipment performance, focus of lens system, diaphragm alignment, lens mounts, or film transport, using precision gauges.<br>4) Clean and lubricate cameras and polish camera lenses, using cleaning materials and work aids.<br>5) Install electrical assemblies and wiring in aircraft camera housings and memory cards or film in cameras, following blueprints and using hand tools and soldering equipment.<br>6) Requisition parts or materials.<br>7) Calibrate and verify accuracy of light meters, shutter diaphragm operation, or lens carriers, using timing instruments.<br>8) Examine cameras, equipment, processed film, or laboratory reports to diagnose malfunction, using work aids and specifications.<br>9) Read and interpret engineering drawings, diagrams, instructions, or specifications to determine needed repairs, fabrication method, and operation sequence.<br>10) Measure parts to verify specified dimensions or settings, such as camera shutter speed or light meter reading accuracy, using measuring instruments.<br>11) Assemble aircraft cameras, still or motion picture cameras, photographic equipment, or frames, using diagrams, blueprints, bench machines, hand tools, or power tools.<br>12) Fabricate or modify defective electronic, electrical, or mechanical components, using bench lathe, milling machine, shaper, grinder, | 5) Use and maintain various pieces of ground support and test equipment as required.<br>6) Understand and follow instructions and the ability to concentrate is required.<br>7) Excellent written, verbal, communication and interpersonal skills.<br>8) The ability to get along with others or to be part of a team.<br>9) Generate reports and calculations to support instrumentation configurations and documentation.<br>10) Access to Export Control Information required. | defects in light duty trucks, motorcycles, automobiles and general or special purpose automotive equipment.<br>4) Makes repairs, adjustments or replacement of parts and directs other kinds of servicing and maintenance work required to keep a police motorcycle and its specialized equipment and accessories in a safe and efficient condition of operation.<br>5) Coordinates all phases of work pertaining to the testing, examination, adjusting, servicing and repairing of powered reel, rotary and vericut mowers, and related landscape equipment.<br>6) Makes minor and major repairs to engines, chassis and appurtenances of mechanical equipment, repairing or replacing worn or defective parts.<br>7) Maintains various equipment, stock inventory and performance records for the shop.<br>8) Determines the necessity for new parts and equipment and makes requisitions from a central storeroom of needed supplies and equipment.<br>9) Inspects repair work of subordinates and makes road tests to check performance after repairs and overhauling.<br>10) Trains and instructs new employees in all aspects of operations. |

| AREA | **ELECTRONIC AND OPTICAL EQUIPMENT**<br>Responsibilities May Includes | **AIRCRAFT ENGINE INSTRUMENTS**<br>Responsibilities May Includes | **AUTOMOTIVE EMISSIONS TESTING EQUIPMENT**<br>Responsibilities May Includes |
|---|---|---|---|
| | or precision hand tools, according to specifications.<br>13) Record test data and document fabrication techniques on reports.<br>14) Lay out reference points and dimensions on parts or metal stock to be machined, using precision measuring instruments.<br>15) Recommend design changes or upgrades of microfilming, film-developing, or photographic equipment. | | |
| Level 2 | N/A | **Aircraft Instrumentation and Control Technician**<br>1) Design, install, set up, operate, and maintain existing flight test aircraft computer systems, audio/video systems, and provide technical support of new instrumentation systems.<br>2) Determine parameters to be recorded and the best location and method to record from high level engineering requests using available design data.<br>3) Create/check instrumentation drawing<br>4) Complete post-processing of flight test data for dissemination to the engineering department and support of engineering data requests.<br>5) Apply and install strain gauges, using appropriate adhesives, soldering methods, and wiring.<br>6) Calibrate instrumentation systems using resistance, pressure, force, length, temperature, current, voltage, and frequency standards. | **Automotive Instrumentation Measurement Technician**<br>1) Keeps equipment available for use by inspecting and testing vehicles; completing preventive maintenance<br>2) Maintains vehicle functional condition<br>3) Verifies vehicle serviceability by conducting test drives; adjusting controls and systems.<br>4) Complies with state vehicle requirements by testing engine, safety, and combustion control standards.<br>5) Maintains vehicle appearance by cleaning, washing, and painting.<br>6) Maintains vehicle records by recording service and repairs.<br>7) Keeps shop equipment operating<br>8) Keeps supplies ready by inventorying stock; placing orders; verifying receipt.<br>9) Updates job knowledge by participating in educational opportunities; reading technical publications.<br>10) Accomplishes maintenance and organization |

| AREA | **ELECTRONIC AND OPTICAL EQUIPMENT**<br>Responsibilities May Includes | **AIRCRAFT ENGINE INSTRUMENTS**<br>Responsibilities May Includes | **AUTOMOTIVE EMISSIONS TESTING EQUIPMENT**<br>Responsibilities May Includes |
|---|---|---|---|
| | | 7) Use frequency counters and oscilloscopes to test, calibrate, and troubleshoot instrumentation installations and equipment.<br>8) Install pressure measurement transducers and signal conditioning in pneumatic systems, hydraulic systems and pitot-static systems.<br>9) Perform leak checks, airspeed and altitude calibration on aircraft and instrumentation pitot-static systems.<br>10) Install and maintain nose boom and trailing cone instrumentation and hardware.<br>11) Install, maintain and calibrate accelerometers and associated signal conditioning.<br>12) Install and calibrate position measuring devices.<br>13) Install thermocouples using appropriate hardware and Install and maintain instrumentation interphone/radio crew station and equipment.<br>14) Maintain calibration records and documentation.<br>15) Maintain a clean, safe and healthy work area | mission by completing related results as needed. |
| Level 1 | N/A | N/A | N/A |

Table 4.5f: List of Responsibilities for Group 331 according to NOSS Levelling (7 of 16)

| AREA | **REPAIR AND MAINTENANCE OF THE MEASURING, TESTING, NAVIGATING AND CONTROL EQUIPMENT**<br>Responsibilities May Includes | **TIME CLOCKS, TIME/DATE STAMPS, TIME LOCKS AND SIMILAR TIME RECORDING DEVICES)**<br>Responsibilities May Includes | **REPAIR AND MAINTENANCE OF IRRADIATION, ELECTRO MEDICAL AND ELECTROTHERAPEUTIC EQUIPMENT**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 5 | **Instrumentation and Control Engineer**<br>1) To ensure all safety procedures are followed.<br>2) To plan and coordinate all control system and instrumentation activities in the plant.<br>3) To assign daily work to Engineering personnel oversee their work.<br>4) To plan and assist in plant maintenance to ensure that all equipment is functioning properly and to ensure any plant machinery or equipment breakdown is attended to promptly and properly.<br>5) To plan and execute instrumentation calibration according to required accuracy and frequency.<br>6) To involve in control system continuous improvement plan and machinery automation.<br>7) To oversee installation and testing of new control system and instrumentation.<br>8) To prepare report on the engineering matters including repairs, personnel needs, spare parts and supplies.<br>9) To monitor all relevant spare part and ensure appropriate spare part stock is available.<br>10) To review control system and instrumentation documentation to ensure they are accurate and applicable to plan machinery.<br>11) To work with internal & external regulatory agency inspectors to correct any aspects of maintenance that is cited for inspection.<br>12) To coach and mentor successor.<br>13) Perform any other tasks assigned by | N/A | **Biomedical Equipment Maintenance Engineer**<br>1) Schedule plan for repair, install, maintain, calibrate and inspect medical equipment and instrumentations of bio-medical equipment.<br>2) Analyse, test & run diagnostic programs using programming system/tools.<br>3) Interpret schematics, diagrams and illustrated parts of bio-medical instruments.<br>4) Diagnose, calibrate and correct system and equipment malfunctions<br>5) Ensure documentation of inspections, equipment repair & scheduled maintenance as well as equipment failures history is updated.<br>6) Recommend and coordinate third party repairs if required.<br>7) Provide technical assistance and instructions to personnel regarding equipment operation & maintenance.<br>8) Review outcome of preventative maintenance actions & identify and recommend improvements accordingly to relevant parties. |

| AREA | **REPAIR AND MAINTENANCE OF THE MEASURING, TESTING, NAVIGATING AND CONTROL EQUIPMENT**<br>Responsibilities May Includes | **TIME CLOCKS, TIME/DATE STAMPS, TIME LOCKS AND SIMILAR TIME RECORDING DEVICES)**<br>Responsibilities May Includes | **REPAIR AND MAINTENANCE OF IRRADIATION, ELECTRO MEDICAL AND ELECTROTHERAPEUTIC EQUIPMENT**<br>Responsibilities May Includes |
|---|---|---|---|
| | Manager. | | |
| Level 4 | **Instrumentation and Control Assistant Engineer**<br>1) To ensure all safety procedures are followed.<br>2) To plan and coordinate all control system and instrumentation activities in the plant.<br>3) To assign daily work to Engineering personnel oversee their work.<br>4) Working with other disciplines as a team to ensure projects are executed achieving safety, quality and targeted timeframe within cost and schedule.<br>5) To plan and assist in plant maintenance to ensure that all equipment is functioning properly and to ensure any plant machinery or equipment breakdown is attended to promptly and properly.<br>6) To plan and execute instrumentation calibration according to required accuracy and frequency.<br>7) To involve in control system continuous improvement plan and machinery automation.<br>8) To oversee installation and testing of new control system and instrumentation.<br>9) To prepare report on the engineering matters including repairs, personnel needs, spare parts and supplies.<br>10) To monitor all relevant spare part and ensure appropriate spare part stock is available.<br>11) To review control system and instrumentation documentation to ensure they are accurate and applicable to plan machinery. | N/A | **Biomedical Equipment Maintenance Assistant Engineer**<br>1) Assist with scheduling of repair, install, maintain, calibrate and inspect medical equipment and instrumentations of bio-medical equipment.<br>2) Assist the test & run diagnostic programs using programming system/tools and recording of the data and history of the diagnostic.<br>3) Interpret schematics, diagrams and illustrated parts of bio-medical instruments and advise engineer of any inconsistencies.<br>4) Diagnose, calibrate and provide recommendations to correct system and equipment malfunctions.<br>5) Maintain documentation of inspections, equipment repair & scheduled maintenance as well as equipment failures history.<br>6) Assist and evaluate third party repairs if required.<br>7) Recommends technical assistance and instructions to supervisors regarding equipment operation, maintenance and improvements when required.<br>8) Review outcome of preventative maintenance actions & make recommendations of improvements accordingly to relevant parties |

| AREA | **REPAIR AND MAINTENANCE OF THE MEASURING, TESTING, NAVIGATING AND CONTROL EQUIPMENT**<br>Responsibilities May Includes | **TIME CLOCKS, TIME/DATE STAMPS, TIME LOCKS AND SIMILAR TIME RECORDING DEVICES)**<br>Responsibilities May Includes | **REPAIR AND MAINTENANCE OF IRRADIATION, ELECTRO MEDICAL AND ELECTROTHERAPEUTIC EQUIPMENT**<br>Responsibilities May Includes |
|---|---|---|---|
| | 12) To work with internal & external regulatory agency inspectors to correct any aspects of maintenance that is cited for inspection.<br>13) To coach and mentor successor.<br>14) Perform any other tasks assigned by Manager/ Engineer. | | |
| Level 3 | **Instrumentation and Control Supervisor**<br>1) Installation and wiring for instruments, valves, control panel and others independently.<br>2) Troubleshooting instruments, valves, control panel fault.<br>3) Prepare report of the result of troubleshooting.<br>4) Able to perform numerous testing works.<br>5) To ensure onsite safety, and quality awareness.<br>6) Occasional ad-hoc duties that may be assigned by higher level. | **Watch Repair Technician**<br>1) To lubricate equipment to allow proper functioning.<br>2) Repair or replace broken, damaged, or worn parts on timepieces, using lathes, drill presses, and hand tools.<br>3) To replace worn, damaged, or defective mechanical parts.<br>4) To clean, rinse, and dry timepiece parts, using solutions and ultrasonic or mechanical watch-cleaning machines.<br>5) To clean equipment, parts, or tools to repair or maintain them in good working order.<br>6) To disassemble timepieces and inspect them for defective, worn, misaligned, or rusty parts, using loupes.<br>7) To inspect mechanical equipment to locate damage, defects, or wear.<br>8) Reassemble timepieces, replacing glass faces and batteries, before returning them to customers.<br>9) Fabricate parts for watches and clocks, using small lathes, other machines parts or components.<br>10) Test timepiece accuracy and performance, | **Biomedical Equipment Maintenance Supervisor**<br>1) Supervise tests, repair and scheduled maintenance and ensuring adherence to relevant biomedical codes<br>2) Identify needs of modifications on equipment if deemed required and according to relevant standards<br>3) Supervise preventive maintenance schedule and conducting test according to manufacturer's instructions.<br>4) Troubleshooting and repairing malfunctions & calling for special service if required.<br>5) Maintains updated records and anticipating needs of biomedical equipment maintenance supplies inventory.<br>6) Ensure maintenance reports are updated and completed as required. |

| AREA | **REPAIR AND MAINTENANCE OF THE MEASURING, TESTING, NAVIGATING AND CONTROL EQUIPMENT**<br>Responsibilities May Includes | **TIME CLOCKS, TIME/DATE STAMPS, TIME LOCKS AND SIMILAR TIME RECORDING DEVICES)**<br>Responsibilities May Includes | **REPAIR AND MAINTENANCE OF IRRADIATION, ELECTRO MEDICAL AND ELECTROTHERAPEUTIC EQUIPMENT**<br>Responsibilities May Includes |
|---|---|---|---|
| | | using meters and other electronic instruments<br>11) Test mechanical equipment to ensure proper functioning.<br>12) Adjust timing regulators, using truing calipers, watch-rate recorders, and tweezers.<br>13) Record quantities and types of timepieces repaired, serial and model numbers of items, work performed, and charges for repairs.<br>14) Gather information from customers about a timepiece's problems and its service history.<br>15) Confer with customers or users to assess problems.<br>16) Test and replace batteries and other electronic components.<br>17) Test electrical circuits or components for proper functioning.<br><br>**<u>Clocksmith</u>**<br>1) Maintained/installed locks, keying systems, time locks etc., ensuring they are repaired and operational for minimal business impact<br>2) Managed a high-volume workload within a deadline-driven environment.<br>3) Cuts new or duplicate keys, using key cutting machine.<br>4) Insert new or repaired tumblers into lock to change combination<br>5) Disassemble locks, like padlocks, safe locks and door locks and repairs or replaces worn tumblers, springs and other parts | |

| AREA | **REPAIR AND MAINTENANCE OF THE MEASURING, TESTING, NAVIGATING AND CONTROL EQUIPMENT**<br>Responsibilities May Includes | **TIME CLOCKS, TIME/DATE STAMPS, TIME LOCKS AND SIMILAR TIME RECORDING DEVICES)**<br>Responsibilities May Includes | **REPAIR AND MAINTENANCE OF IRRADIATION, ELECTRO MEDICAL AND ELECTROTHERAPEUTIC EQUIPMENT**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 2 | **Instrumentation and Control Technician**<br>1) Installation and wiring for instruments, valves, control panel and others.<br>2) Troubleshooting instruments, valves, control panel fault.<br>3) Able to perform simple testing works.<br>4) Onsite safety, and quality awareness.<br>5) Occasional ad-hoc duties that may be assigned by higher level. | N/A | **Biomedical Equipment Maintenance Technician**<br>1) Tests, repair and scheduled maintenance and ensuring adherence to relevant biomedical codes<br>2) Identify needs of modifications on equipment if deemed required and according to relevant standards<br>3) Carry out preventive maintenance schedule and conducting test according to manufacturer's instructions.<br>4) Troubleshooting and repairing malfunctions & calling for special service if required.<br>5) Maintains updated records and anticipating needs of biomedical equipment maintenance supplies inventory.<br>6) Ensure maintenance reports are updated and completed as required. |
| Level 1 | N/A | N/A | N/A |

Table 4.5g: List of Responsibilities for Group 331 according to NOSS Levelling (8 of 16)

| AREA | **REPAIR AND MAINTENANCE OF IRRADIATION, ELECTRO MEDICAL AND ELECTROTHERAPEUTIC EQUIPMENT (PACEMAKERS)**<br>Responsibilities May Includes | **REPAIR AND MAINTENANCE OF IRRADIATION, ELECTRO MEDICAL AND ELECTROTHERAPEUTIC EQUIPMENT (HEARING AIDS)**<br>Responsibilities May Includes | **REPAIR OF OPTICAL INSTRUMENTS AND PHOTOGRAPHIC EQUIPMENT (BINOCULARS, MICROSCOPES, TELESCOPES, PRISMS AND LENSES)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 5 | **Pacemaker Specialist**<br>1) Interrogate, interpret and re-program cardiac devices with minimal supervision.<br>2) Trouble shoot critical device issues and take immediate steps toward resolution.<br>3) Collaborate with physicians regarding device status and accurately document device analysis in Electronic Medical Record (EMR) for review.<br>4) Maintains updated record and history data of equipment. | **Hearing Aids Specialist**<br>1) Select, administer & interpret tests to evaluate equipment's performance.<br>2) Repair or modify impressions for hearing instrument efficacy.<br>3) Demonstrate assistive listening devices (ALDs) to clients upon repairing & maintenance.<br>4) Ensure updated report and history data is captured is recorded on the repair & maintenance of equipment.<br>5) Diagnose and identify equipment's disabilities and the required solution for repair & maintenance.<br>6) Review & diagnose frequency response curve of the equipment and identify any abnormalities that require repair/maintenance. | N/A |
| Level 4 | N/A | **Hearing Aids Assistant Specialist**<br>1) Select, administer & interpret tests to evaluate equipment's performance.<br>2) Repair or modify impressions for hearing instrument efficacy.<br>3) Demonstrate assistive listening devices (ALDs) to clients upon repairing & maintenance.<br>4) Ensure updated report and history data is captured is recorded on the repair & maintenance of equipment. | N/A |

| AREA | **REPAIR AND MAINTENANCE OF IRRADIATION, ELECTRO MEDICAL AND ELECTROTHERAPEUTIC EQUIPMENT (PACEMAKERS)**<br>Responsibilities May Includes | **REPAIR AND MAINTENANCE OF IRRADIATION, ELECTRO MEDICAL AND ELECTROTHERAPEUTIC EQUIPMENT (HEARING AIDS)**<br>Responsibilities May Includes | **REPAIR OF OPTICAL INSTRUMENTS AND PHOTOGRAPHIC EQUIPMENT (BINOCULARS, MICROSCOPES, TELESCOPES, PRISMS AND LENSES)**<br>Responsibilities May Includes |
|---|---|---|---|
| | | 5) Diagnose and identify equipment's disabilities and the required solution for repair & maintenance.<br>6) Review & diagnose frequency response curve of the equipment and identify any abnormalities that require repair/maintenance. | |
| Level 3 | N/A | **Hearing Aids Technician**<br>1) Repair defects that includes wiring and soldering components.<br>2) Inspection of hearing aid equipment in accordance to manufacturing standards.<br>3) Collate device history records as well as repair & scheduled maintenance records.<br>4) Report any inconsistencies of report/performance of the equipment to the hearing aid specialist.<br>5) Conduct test & diagnose frequency response curve of the equipment and report any abnormalities that require repair/maintenance to specialist. | **Microscope Service Technician**<br>1) Evaluate, test, troubleshoot, repair, and perform preventative maintenance on binoculars, microscopes, telescopes, prism and lenses.<br>2) Disassemble, clean, lubricate, reassemble, and make mechanical adjustments and optical alignments on various brands and models of binoculars, microscopes, telescopes, prism and lenses.<br>3) Perform necessary service & diagnostic reports on equipment in a complete and accurate manner.<br>4) Maintains supply inventory of maintenance equipment and reorders as necessary.<br>5) Provides technical advice, demonstrations, training and support to clients when required. |
| Level 2 | N/A | N/A | N/A |
| Level 1 | N/A | N/A | N/A |

Table 4.5h: List of Responsibilities for Group 331 according to NOSS Levelling (9 of 16)

| AREA | **REPAIR OF OPTICAL INSTRUMENTS AND PHOTOGRAPHIC EQUIPMENT**<br>Responsibilities May Includes | **REPAIR OF ELECTRICAL EQUIPMENT**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (SHIP HULL)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 5 | N/A | **Mechanical & Electrical Engineer**<br>1) Evaluates electrical systems, products, components, and applications by designing and conducting research programs; applying knowledge of electricity and materials.<br>2) Confirms system's and components' capabilities by designing testing methods; testing properties.<br>3) Develops electrical products by studying customer requirements; researching and testing manufacturing and assembly methods and materials.<br>4) Develops manufacturing processes by designing and modifying equipment for building and assembling electrical components; soliciting observations from operators.<br>5) Assures product quality by designing electrical testing methods; testing finished products and system capabilities.<br>6) Prepares product reports by collecting, analysing, and summarising information and trends.<br>7) Provides engineering information by answering questions and requests.<br>8) Maintains product and company reputation by complying with federal and state regulations.<br>9) Keeps equipment operational by following manufacturer's instructions and established procedures; requesting repair service.<br>10) Maintains product data base by writing computer programs; entering data. | **Ship Hull and Superstructure Construction & Maintenance Engineer**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements.<br>2) Plan & organise ship hull construction.<br>3) Review & endorse tools, equipment & materials preparation.<br>4) Plan & organise ship hull testing.<br>5) Plan & organise ship hull repair.<br>6) Plan & organise block assembly, plug making, lamination and lay up.<br>7) Review & endorse the mould & mould preparation.<br>8) Review & endorse design modification.<br>9) Plan & organise system integration.<br>10) Plan & organise ship hull outfitting.<br>11) Adhere to quality assurance & quality control procedures.<br>12) Review & endorse activities report. |

| AREA | **REPAIR OF OPTICAL INSTRUMENTS AND PHOTOGRAPHIC EQUIPMENT**<br>Responsibilities May Includes | **REPAIR OF ELECTRICAL EQUIPMENT**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (SHIP HULL)**<br>Responsibilities May Includes |
|---|---|---|---|
| | | 11) Completes projects by training and guiding technicians.<br>12) Maintains professional and technical knowledge by attending educational workshops; reviewing professional publications; establishing personal networks; participating in professional societies.<br>13) Contributes to team effort by accomplishing related results as needed. | |
| Level 4 | N/A | **<u>Mechanical & Electrical Assistant Engineer</u>**<br>1) Assist in evaluating electrical systems, products, components, and applications by designing and conducting research programs; applying knowledge of electricity and materials.<br>2) Assist in confirmation system's and components' capabilities by designing testing methods; testing properties.<br>3) Assist in developing electrical products by studying customer requirements; researching and testing manufacturing and assembly methods and materials.<br>4) Assist in developing manufacturing processes by designing and modifying equipment for building and assembling electrical components; soliciting observations from operators.<br>5) Assures product quality by designing electrical testing methods; testing finished products and system capabilities.<br>6) Assist in preparing product reports by collecting, analysing, and summarising | **<u>Ship Hull and Superstructure Construction & Maintenance Assistant Engineer</u>**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements.<br>2) Coordinate tools, equipment & materials preparation.<br>3) Coordinate ship hull construction work.<br>4) Coordinate ship hull testing.<br>5) Coordinate ship hull repair.<br>6) Verify block assembly.<br>7) Coordinate ship hull plug making, lamination and lay up.<br>8) Analyse & review the mould & mould preparation.<br>9) Perform design modification.<br>10) Perform system integration.<br>11) Coordinate ship hull outfitting.<br>12) Adhere to quality assurance & quality control procedures.<br>13) Analyse & review activities report. |

| AREA | **REPAIR OF OPTICAL INSTRUMENTS AND PHOTOGRAPHIC EQUIPMENT**<br>Responsibilities May Includes | **REPAIR OF ELECTRICAL EQUIPMENT**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (SHIP HULL)**<br>Responsibilities May Includes |
|---|---|---|---|
| | | information and trends.<br>7) Assist in providing engineering information by answering questions and requests.<br>8) Assist in maintaining product and company reputation by complying with federal and state regulations.<br>9) Keeps equipment operational by following manufacturer's instructions and established procedures; requesting repair service.<br>10) Maintains product data base by writing computer programs; entering data.<br>11) Completes projects by training and guiding technicians.<br>12) Maintains professional and technical knowledge by attending educational workshops; reviewing professional publications; establishing personal networks; participating in professional societies.<br>13) Contributes to team effort by accomplishing related results as needed. | |
| Level 3 | **Camera & Photographic Equipment Repairer**<br>1) Adjust & calibrate equipment to ensure optimal performance.<br>2) Examine cameras, equipment, processed film, or laboratory reports to diagnose malfunction, using work aids and specifications<br>3) Read and interpret engineering drawings, diagrams, instructions, or specifications to determine needed repairs, fabrication method, and operation sequence.<br>4) Disassemble equipment for maintenance or | **Mechanical & Electrical Supervisor**<br>1) Supervise assembling works, installation, testing, and maintaining electrical or electronic wiring, equipment, appliances, apparatus, and fixtures, using hand tools and power tools.<br>2) Supervise diagnosing malfunctioning systems, apparatus, and components, using test equipment and hand tools, to locate the cause of a breakdown and correct the problem.<br>3) Supervise connecting wires to circuit | **Ship Hull and Superstructure Construction & Maintenance Supervisor**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements.<br>2) Supervise tools, equipment & materials preparation.<br>3) Supervise and check material marking.<br>4) Supervise plate and material cutting.<br>5) Carry out ship hull testing<br>6) Carry out & check material fabrication.<br>7) Carry out & check ship hull installation.<br>8) Carry out ship hull repair. |

| AREA | **REPAIR OF OPTICAL INSTRUMENTS AND PHOTOGRAPHIC EQUIPMENT**<br>Responsibilities May Includes | **REPAIR OF ELECTRICAL EQUIPMENT**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (SHIP HULL)**<br>Responsibilities May Includes |
|---|---|---|---|
| | repair.<br>5) Test mechanical equipment to ensure proper functioning.<br>6) Install electrical components, equipment, or systems.<br>7) Order materials, supplies, or equipment.<br>8) Record test data and document fabrication techniques on reports<br>9) Advise others on issues related to repairs, installation, or equipment design | breakers, transformers, or other components.<br>4) Supervise inspecting electrical systems, equipment, and components to identify hazards, defects, and the need for adjustment or repair, and to ensure compliance with codes.<br>5) Advise management on whether continued operation of equipment could be hazardous.<br>6) Supervise testing electrical systems and continuity of circuits in electrical wiring, equipment, and fixtures, using testing devices such as ohmmeters, voltmeters, and oscilloscopes, to ensure compatibility and safety of system.<br>7) Supervise plan layout and installation of electrical wiring, equipment and fixtures, based on job specifications and local codes.<br>8) Check sketches or follow blueprints to determine the location of wiring and equipment and to ensure conformance to building and safety codes.<br>9) Use a variety of tools and equipment such as power construction equipment, measuring devices, power tools, and testing equipment including oscilloscopes, ammeters, and test lamps.<br>10) Supervise repairing or replacing wiring, equipment, and fixtures, using hand tools and power tools. | 9) Adhere to quality assurance & quality control procedures.<br>10) Update activities checklist. |

| AREA | **REPAIR OF OPTICAL INSTRUMENTS AND PHOTOGRAPHIC EQUIPMENT**<br>Responsibilities May Includes | **REPAIR OF ELECTRICAL EQUIPMENT**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (SHIP HULL)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 2 | N/A | **Mechanical & Electrical Technician**<br>1) Assemble, install, test, and maintain electrical or electronic wiring, equipment, appliances, apparatus, and fixtures, using hand tools and power tools.<br>2) Diagnose malfunctioning systems, apparatus, and components, using test equipment and hand tools, to locate the cause of a breakdown and correct the problem.<br>3) Connect wires to circuit breakers, transformers, or other components.<br>4) Inspect electrical systems, equipment, and components to identify hazards, defects, and the need for adjustment or repair, and to ensure compliance with codes.<br>5) Advise management on whether continued operation of equipment could be hazardous.<br>6) Test electrical systems and continuity of circuits in electrical wiring, equipment, and fixtures, using testing devices such as ohmmeters, voltmeters, and oscilloscopes, to ensure compatibility and safety of system.<br>7) Plan layout and installation of electrical wiring, equipment and fixtures, based on job specifications and local codes.<br>8) Prepare sketches or follow blueprints to determine the location of wiring and equipment and to ensure conformance to building and safety codes.<br>9) Use a variety of tools and equipment such as power construction equipment, measuring devices, power tools, and testing equipment including oscilloscopes, ammeters, and test | **Ship Hull and Superstructure Construction & Maintenance Fitter**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements.<br>2) Carry out tools, equipment & materials preparation.<br>3) Carry out marking works.<br>4) Carry out plate and material cutting.<br>5) Carry out ship hull fabrication.<br>6) Carry out ship hull installation.<br>7) Carry out ship hull repair.<br>8) Adhere to quality assurance & quality control procedures.<br>9) Update activities checklist. |

| AREA | **REPAIR OF OPTICAL INSTRUMENTS AND PHOTOGRAPHIC EQUIPMENT** Responsibilities May Includes | **REPAIR OF ELECTRICAL EQUIPMENT** Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (SHIP HULL)** Responsibilities May Includes |
|---|---|---|---|
| | | lamps.<br>10) Repair or replace wiring, equipment, and fixtures, using hand tools and power tools. | |
| Level 1 | N/A | N/A | N/A |

Table 4.5i: List of Responsibilities for Group 331 according to NOSS Levelling (10 of 16)

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (SHIP PIPING SYSTEM)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (SHIP ELECTRONIC SYSTEM)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (SHIP ELECTRICAL SYSTEM)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 5 | **Ship Piping System Installation & Maintenance Engineer**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements.<br>2) Evaluate & endorse tools, equipment & materials procurement.<br>3) Plan & organise piping system installation.<br>4) Plan & organise piping system fabrication.<br>5) Plan & organise piping system repairing.<br>6) Review & endorse quality assurance & quality control procedures.<br>7) Plan & organise piping system preservation.<br>8) Endorse piping system installation, fabrication & repairing checklist | **Ship Electronic System Installation & Maintenance Engineer**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements.<br>2) Evaluate & endorse tools, equipment & materials procurements.<br>3) Monitor & control switch gear operation.<br>4) Plan & organise electronic preventive maintenance activities.<br>5) Plan & organise electronic repairing.<br>6) Monitor & control electronic installation activities.<br>7) Adhere to quality assurance & quality control procedures.<br>8) Monitor & control electronic troubleshooting.<br>9) Review & endorse design adjustment.<br>10) Review & endorse electronic equipment inspection & calibration.<br>11) Manage electronic testing & commissioning.<br>12) Endorse activities checklist | **Ship Electrical System Installation & Maintenance Engineer**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements.<br>2) Evaluate & endorse tools, equipment & materials procurements.<br>3) Monitor & control switch gear operation.<br>4) Plan & organise electrical preventive maintenance activities.<br>5) Plan & organise electrical repairing.<br>6) Monitor & control electrical installation activities.<br>7) Adhere to quality assurance & quality control procedures.<br>8) Monitor & control electrical troubleshooting.<br>9) Review & endorse design adjustment.<br>10) Review & endorse electrical equipment inspection & calibration.<br>11) Manage electrical testing & commissioning.<br>12) Endorse activities checklist |
| Level 4 | **Ship Piping System Installation & Maintenance Assistant Engineer**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements.<br>2) Coordinate piping system installation & maintenance tools, equipment & materials availability.<br>3) Monitor & control piping system installation activities.<br>4) Monitor & control piping system fabrication | **Ship Electronic System Installation & Maintenance Assistant Engineer**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements.<br>2) Coordinate tools, equipment & materials availability.<br>3) Coordinate switch gear operations.<br>4) Coordinate electronic preventive maintenance activities.<br>5) Coordinate electronic repairing. | **Ship Electrical System Installation & Maintenance Assistant Engineer**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements.<br>2) Coordinate tools, equipment & materials availability.<br>3) Coordinate switch gear operations.<br>4) Coordinate electrical preventive maintenance activities.<br>5) Coordinate electrical repairing. |

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (SHIP PIPING SYSTEM)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (SHIP ELECTRONIC SYSTEM)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (SHIP ELECTRICAL SYSTEM)**<br>Responsibilities May Includes |
|---|---|---|---|
| | activities.<br>5) Monitor & control piping system repairing activities.<br>6) Perform piping system installation quality assurance & quality control procedures.<br>7) Manage piping system preservation activities.<br>8) Verify piping system installation, fabrication & repairing checklist | 6) Coordinate electronic installation activities.<br>7) Perform quality assurance & quality control procedures.<br>8) Coordinate electronic troubleshooting.<br>9) Verify electronic equipment inspection & calibration.<br>10) Verify electronic testing & commissioning.<br>11) Verify activities checklist | 6) Coordinate electrical installation activities.<br>7) Perform quality assurance & quality control procedures.<br>8) Coordinate electrical troubleshooting.<br>9) Verify electrical equipment inspection & calibration.<br>10) Verify electrical testing & commissioning.<br>11) Verify activities checklist |
| Level 3 | **Ship Piping System Installation & Maintenance Supervisor**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements.<br>2) Coordinate tools, equipment & materials preparation.<br>3) Supervise piping system installation activities.<br>4) Supervise piping system fabrication activities.<br>5) Supervise piping system repairing activities.<br>6) Adhere to quality assurance & quality control procedures.<br>7) Supervise piping system preservation activities.<br>8) Check piping system installation, fabrication & repairing report | **Ship Electronic System Installation & Maintenance Supervisor**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements.<br>2) Supervise tools, equipment & materials preparation.<br>3) Supervise switch gear operations.<br>4) Supervise electronic preventive maintenance activities.<br>5) Supervise electronic repairing.<br>6) Supervise electronic installation activities.<br>7) Adhere to quality assurance & quality control procedures.<br>8) Supervise electronic troubleshooting.<br>9) Perform electronic testing & commissioning.<br>10) Perform electronic equipment inspection & calibration.<br>11) Check activities checklist. | **Ship Electrical System Installation & Maintenance Supervisor**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements.<br>2) Supervise tools, equipment & materials preparation.<br>3) Supervise switch gear operations.<br>4) Supervise electrical preventive maintenance activities.<br>5) Supervise electrical repairing.<br>6) Supervise electrical installation activities.<br>7) Adhere to quality assurance & quality control procedures.<br>8) Supervise electrical troubleshooting.<br>9) Perform electrical testing & commissioning.<br>10) Perform electrical equipment inspection & calibration.<br>11) Check activities checklist. |
| Level 2 | **Ship Piping System Installation & Maintenance Fitter**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements.<br>2) Carry out tools, equipment & materials | **Ship Electronic System Installation & Maintenance Fitter**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements.<br>2) Carry out tools, equipment & materials | **Ship Electrical System Installation & Maintenance Fitter**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements. |

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (SHIP PIPING SYSTEM)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (SHIP ELECTRONIC SYSTEM)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (SHIP ELECTRICAL SYSTEM)**<br>Responsibilities May Includes |
|---|---|---|---|
| | preparation<br>3) Carry out piping system installation<br>4) Carry out piping system fabrication<br>5) Carry out piping system repairing<br>6) Adhere to quality assurance & quality control procedures<br>7) Carry out piping system preservation<br>8) Update piping system installation, fabrication & repairing checklist | preparation.<br>3) Carry out switch gear operation.<br>4) Carry out electronic preventive maintenance activities.<br>5) Carry out electronic repairing.<br>6) Carry out electronic installation activities.<br>7) Adhere to quality assurance & quality control procedures.<br>8) Carry out electronic troubleshooting.<br>9) Update activities checklist | 2) Carry out tools, equipment & materials preparation.<br>3) Carry out switch gear operation.<br>4) Carry out electrical preventive maintenance activities.<br>5) Carry out electrical repairing.<br>6) Carry out electrical installation activities.<br>7) Adhere to quality assurance & quality control procedures.<br>8) Carry out electrical troubleshooting.<br>9) Update activities checklist |
| Level 1 | N/A | N/A | N/A |

Table 4.5j: List of Responsibilities for Group 331 according to NOSS Levelling (11 of 16)

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (SHIP ENGINE MAINTENANCE**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (LOCOMOTIVES AND RAILROAD CARS)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AVIATION MECHANICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 5 | **Second Watchkeeping Engineer**<br>1) Responsible for risk assessment, briefing and safety training of the entire engine crew, especially for the junior engineers and fresh crew.<br>2) Operate & maintain lifesaving appliances and firefighting appliances.<br>3) Manage all the emergency machinery and equipment's.<br>4) In-Charge of pollution prevention equipment onboard.<br>5) Responsible for all oil transfer operations carried out onboard including bunkering.<br>6) Distributes and assigns task to engine crew members.<br>7) Keep and maintain record of the spares' inventory.<br>8) Responsible for the maintenance of all the engine room and deck machinery.<br>9) Responsible all the machineries and safety systems are working safely, efficiently and within the provided parameters.<br>10) Plan maintenance system (PMS). | **Rolling Stock Maintenance Engineer**<br>1) Plan and coordinate roll stock maintenance projects with the aim of improving the security, reliability, service, condition and comfort of the facilities.<br>2) Plan, coordinate and carry out projects relating to the installation of new trains and refurbishment.<br>3) Assist rolling stock depots, both providing technical support and helping to implement new projects.<br>4) Manage the work teams that perform maintenance on the rolling stock fleet.<br>5) Ensure that the train maintenance and installation procedures and guidelines established are properly adhered to both internally and by external suppliers.<br>6) Serve as the rolling stock expert when participating in technical projects led by other departments of the company.<br>7) Interpret information related to incidents or repairs and draw up reports that determine the state of the rolling stock fleet. To act on the basis of these reports, suggesting new projects with the aim of improving the state of the fleet. | **Aviation Mechanical Engineer**<br>1) Supervising the assembly of aircraft systems and engines<br>2) Testing aircraft to measure performance and identify areas for improvement<br>3) Developing design specifications for aircraft systems<br>4) Applying scientific principles to improve the performance of aircraft<br>5) Researching the environmental impact of aircraft and taking action to minimise this<br>6) Investigating problems with aircraft or the causes of accidents<br>7) Creating reports for clients and providing technical advice<br>8) Maintaining aircraft and carrying out regular inspections |
| Level 4 | **Watch Keeping Engineer**<br>1) On fitter work either by day or regular watch keeping within and outside main engine and boiler spaces.<br>2) Responsible for engine and other equipment start-up and shutdown prior vessel departure | **Rolling Stock Maintenance Assistant Engineer**<br>1) Assist in plan and coordinate roll stock maintenance projects with the aim of improving the security, reliability, service, condition and comfort of the facilities.<br>2) Assist in plan, coordinate and carry out | **Aviation Mechanical Assistant Engineer**<br>1) Check the assembly of aircraft systems and engines<br>2) Assist in testing aircraft to measure performance and identify areas for improvement |

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (SHIP ENGINE MAINTENANCE**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (LOCOMOTIVES AND RAILROAD CARS)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AVIATION MECHANICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| | and arrival at port.<br>3) In charge of operation, repair and scheduled maintenance of pumps, air compressors, oil purifiers, fresh water generators, boilers and auxiliary engines.<br>4) On regular watch of main engines and boilers simultaneously.<br>5) Involve in bunkering operation for fuel oil as well as fresh water for the ship operations and domestic consumption.<br>6) Prepare detail service or repair specification and spares requirement prior vessel docking.<br>7) Prepare equipment maintenance report on monthly basis and spare part stock take at regular basis | projects relating to the installation of new trains and refurbishment.<br>3) Assist in providing technical support and helping to implement new projects.<br>4) Assist in perform maintenance on the rolling stock fleet.<br>5) Assist in train maintenance and installation procedures and guidelines established are properly adhered to both internally and by external suppliers.<br>6) Interpret information related to incidents or repairs and draw up reports that determine the state of the rolling stock fleet. To act on the basis of these reports, suggesting new projects with the aim of improving the state of the fleet. | 3) Assist in developing design specifications for aircraft systems<br>4) Applying scientific principles to improve the performance of aircraft<br>5) Assist in researching the environmental impact of aircraft and taking action to minimise this<br>6) Assist in investigating problems with aircraft or the causes of accidents<br>7) Assist in creating reports for clients and providing technical advice<br>8) Maintaining aircraft and carrying out regular inspections |
| Level 3 | **<u>Marine Engine Operation and Maintenance Supervisor</u>**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements.<br>2) Engage in work relating to engine maintenance<br>3) Watch duty in port, sea and the other engine rating<br>4) Engage in watch duty during navigation<br>5) Record temperature, pressure and operating condition of machineries in engine space<br>6) Assist to several maintenance works including housekeeping<br>7) Assist to stand by main engine and another auxiliary engine<br>8) Coats parts with grease, using swabs and | **<u>Rolling Stock Maintenance Supervisor</u>**<br>1) Supervise preventive and corrective maintenance activities and minor modifications on rolling stock<br>2) Check and supervise routine vehicle inspections, inspecting parts for surface defects, changing of consumable items, perform minor repairs and technical cleaning;<br>3) Prepare maintenance scheduling<br>4) Check functional performance of electromechanical assemblies<br>5) Supervise operation of metalworking machines, repair, rework, and calibrate hydraulic and pneumatic assemblies and systems, verify dimensions and clearances of parts to ensure conformance to specifications | **<u>Aviation Mechanical Supervisor</u>**<br>1) Manage all aspects of aircraft maintenance and ensure all work is scheduled and performed in a safe and efficient manner.<br>2) Supervise maintenance staff, which includes reviewing employee performance, addressing personnel issues, generating assignments, and setting priorities<br>3) Perform scheduled/unscheduled maintenance, servicing, launch and recovery, corrosion control, and inspection, and routine through complex maintenance of aircraft, aircraft sub- systems, and components, as required.<br>4) Review work orders regarding modifications and/or upgrades to various aircraft systems. |

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (SHIP ENGINE MAINTENANCE**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (LOCOMOTIVES AND RAILROAD CARS)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AVIATION MECHANICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| | brushes, or dips parts into grease pot<br>9) Dismantle units, such as breech or firing mechanism to facilitate application of grease<br>10) Verify activities checklist | and to meet operational specifications and tolerances;<br>6) Supervise time sensitive fault diagnostics and component replacement (repair in site or inside depot) on the rolling stock;<br>7) Follow the appropriate maintenance procedures and instructions, operating rules and procedures to ensure compliance with the required requirements;<br>8) Check wheel truing of the rolling stock annually or as required<br>9) Implement complex systems or new projects;<br>10) Check maintenance records | 5) Read and interpret manufacturers' and company's maintenance manuals, service bulletins, and other specifications to determine feasibility and method of repairing or replacing malfunctioning or damaged components.<br>6) Adjust, repair, or replace electrical wiring system and aircraft accessories, as required.<br>7) Provide guidance and instruction to team members concerning technical orders, checklists, and hazardous materials.<br>8) Responsible for maintaining equipment maintenance schedules on all company assets and monitoring parts and supply inventories.<br>9) Ensure availability of materials, anticipating requirements and reordering.<br>10) Offer technical guidance to Engineering staff regarding start-up of new equipment and follow-up of maintenance programs.<br>11) Provide employees with proper training on company equipment as required by OSHA Regulations and monitors annual training requirements.<br>12) May supervise and assist in aircraft/equipment movement.<br>13) May conduct flight line and hangar foreign object damage prevention walks and housekeeping.<br>14) May meet with Customers and Company Senior Leadership as required.<br>15) Perform other qualified duties as assigned. |

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (SHIP ENGINE MAINTENANCE**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (LOCOMOTIVES AND RAILROAD CARS)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AVIATION MECHANICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 2 | **Marine Engine Watchkeeper**<br>1) Adhere to Safety, Health & Environmental (SHE) requirements.<br>2) Cleaning the engine room.<br>3) Check and maintain all oil pump levels of main and auxiliary machinery including thrust shaft and propeller shaft bearing.<br>4) Maintain correct levels by adding as necessary.<br>5) Check and maintain correct levels in manually filled oil feeder boxes grease cups of main and auxiliary machinery including pumps, steering gear, and refrigeration machinery.<br>6) Change and clean oil filters as necessary.<br>7) Update activities checklist | **Rolling Stock Maintenance Technician**<br>1) Assist the supervisor in carrying out all level of preventive and corrective maintenance activities and minor modifications on rolling stock including passenger service vehicles, engineering support vehicles, shunting vehicles and wagons;<br>2) Carry out routine vehicle inspections, inspecting parts for surface defects, changing of consumable items, perform minor repairs and technical cleaning;<br>3) Perform roles necessary for the management of the safe system of works, including to meet tight maintenance schedules;<br>4) Test functional performance of electromechanical assemblies using various test instruments, replace, install electrical and electronic parts and hardware in housings or assemblies, align, fit, and assemble component parts, using electronics tools, hand tools, power tools, fixtures, templates, and microscopes;<br>5) Operate metalworking machines, repair, rework, and calibrate hydraulic and pneumatic assemblies and systems, verify dimensions and clearances of parts to ensure conformance to specifications and to meet operational specifications and tolerances;<br>6) Perform time sensitive fault diagnostics and component replacement (repair in site or inside depot) on the rolling stock;<br>7) Follow the appropriate maintenance procedures and instructions, operating rules | **Aviation Mechanical Technician**<br>1) Use technical documentation<br>2) Configure the working environment to prepare for the operation<br>3) Installing and removing aircraft parts, integration, modification and repair, audit, diagnostic, test and evaluation<br>4) Tests and settings, control and quality<br>5) Deliver the Certificate of Release to Service (LMA)<br>6) Participate to all engineering stages (organization, conception, verification, etc.) (HND)<br>7) Independently ensure the technical support for customers (HND) |

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (SHIP ENGINE MAINTENANCE**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (LOCOMOTIVES AND RAILROAD CARS)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AVIATION MECHANICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| | | and procedures to ensure compliance with the required requirements;<br>8) Carry out wheel truing of the rolling stock annually or as required using under-floor wheel lathe, perform bogie overhaul at every four and eight years by inspecting and repairing major bogie components such as traction motors, gear-boxes, wheel-sets, and axle boxes in special purpose-built workshops;<br>9) Assist the supervisor and/ or other technical support staff to implement complex systems or new projects;<br>10) Produce and maintain accurate maintenance records of rolling stock, tools and plant machinery performance, work accomplished and other information using a computerized maintenance management system;<br>11) Implement and follow Permit To Work process;<br>12) Perform shift and emergency duties when required. | |
| Level 1 | N/A | N/A | N/A |

Table 4.5k: List of Responsibilities for Group 331 according to NOSS Levelling (12 of 16)

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (AVIONIC ELECTRICAL)** Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AVIONIC INSTRUMENTATION)** Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (STRUCTURE REPAIR)** Responsibilities May Includes |
|---|---|---|---|
| Level 5 | **Avionics Maintenance Engineer (Electrical)**<br>1) Proficiency in Functional diagram, Wiring diagram, wire bundle installation and equipment installation<br>2) Ability to produce Electrical Load, Electrical Bonding and Voltage drop analysis documents.<br>3) Extensive understanding of EWIS assessment and review against existing instructions for continued airworthiness<br>4) Broad knowledge of aircraft installation safety assessments<br>5) Familiar with aircraft compliance verification test documents<br>6) Research and design with respect to electrical load, function and environmental conditions.<br>7) Define and document electrical interfaces between Aircraft and component system.<br>8) Execute electrical interface design enhancements to support existing and legacy aircrafts.<br>9) Attending project meetings, supplying specialist knowledge of electrical requirements. | **Aviation Maintenance Engineer (Instrumentation)**<br>1) Proficiency in Functional diagram, Wiring diagram, wire bundle installation and equipment installation<br>2) Ability to produce Instrumentation Load, Instrumentation Bonding and Voltage drop analysis documents.<br>3) Extensive understanding of EWIS assessment and review against existing instructions for continued airworthiness<br>4) Broad knowledge of aircraft installation safety assessments (FAR and /or CS25309)<br>5) Familiar with aircraft compliance verification test documents<br>6) Research and design with respect to instrumentation load, function and environmental conditions.<br>7) Define and document instrumentation interfaces between Aircraft and component system.<br>8) Execute instrumentation interface design enhancements to support existing and legacy aircrafts.<br>9) Attending project meetings, supplying specialist knowledge of instrumentation requirements. | **Structure Repair Engineer**<br>1) Analyse configurations of the basic components of a structure<br>2) Calculate the pressures, stresses and strains that each component, such as a beam or lintel, will experience from other parts of the structure due to human use or environmental pressures such as weather or earthquakes<br>3) Consider the strength of various materials<br>4) Liaise with other designers, including architects, to agree on safe designs and their fit with the aesthetic concept of the construction<br>5) Examine structures at risk of collapse and advise how to improve their structural integrity, such as recommending removal or repair of defective parts or rebuilding the entire structure<br>6) Make drawings, specifications and computer models of structures for building contractors<br>7) Work with geotechnical engineers to investigate ground conditions and analyse results of soil sample and in situ tests<br>8) Liaise with construction contractors to ensure that newly erected buildings are structurally sound<br>9) Apply expert knowledge of the forces that act on various structures<br>10) use computers and computer-aided design (CAD) technology for simulation purposes. |

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (AVIONIC ELECTRICAL)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AVIONIC INSTRUMENTATION)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (STRUCTURE REPAIR)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 4 | **Avionics Maintenance Engineer**<br>1) Supervising the assembly of aircraft systems and engines<br>2) Testing aircraft to measure performance and identify areas for improvement<br>3) Developing design specifications for aircraft systems<br>4) Applying scientific principles to improve the performance of aircraft<br>5) Researching the environmental impact of aircraft and taking action to minimise this<br>6) Investigating problems with aircraft or the causes of accidents<br>7) Creating reports for clients and providing technical advice<br>8) Maintaining aircraft and carrying out regular inspections | **Avionics Maintenance Engineer**<br>1) Supervising the assembly of aircraft systems and engines<br>2) Testing aircraft to measure performance and identify areas for improvement<br>3) Developing design specifications for aircraft systems<br>4) Applying scientific principles to improve the performance of aircraft<br>5) Researching the environmental impact of aircraft and taking action to minimise this<br>6) Investigating problems with aircraft or the causes of accidents<br>7) Creating reports for clients and providing technical advice<br>8) Maintaining aircraft and carrying out regular inspections | **Structure Repair Assistant Engineer**<br>1) Check configurations of the basic components of a structure<br>2) Calculate the pressures, stresses and strains that each component<br>3) Check the strength of various materials<br>4) Liaise with other designers, including architects, to agree on safe designs and their fit with the aesthetic concept of the construction<br>5) Analyse structures at risk of collapse and advise how to improve their structural integrity, such as recommending removal or repair of defective parts or rebuilding the entire structure<br>6) Prepare drawings, specifications and computer models of structures for building contractors<br>7) Assist in investigating ground conditions and analyse results of soil sample and in situ tests<br>8) Liaise with construction contractors to ensure that newly erected buildings are structurally sound |
| Level 3 | N/A | N/A | **Structure Repair Supervisor**<br>1) Check aircraft structures and related components<br>2) Check defects using unique aircraft fastening hardware, ferrous and non-ferrous materials, composite materials, chemicals, adhesives, paints and textiles<br>3) Supervise installation aircraft structural components for prototype projects |

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (AVIONIC ELECTRICAL)** Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AVIONIC INSTRUMENTATION)** Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (STRUCTURE REPAIR)** Responsibilities May Includes |
|---|---|---|---|
| | | | 4) Supervise weld base metals, alloys and casting materials, using oxyacetylene, electrical arc, inert gas and resistance welding techniques and equipment<br>5) Supervise manufacturing original aircraft equipment, components or replacement items from base metals using special cutting tools, engine lathe and milling machines<br>6) Supervise fabrication and repairing aircraft structures using composite, fibreglass, textiles, leather, plastic and synthetic components<br>7) Check corrosion control inspections of ferrous and non-ferrous materials<br>8) Maintain life support equipment, ejection seats, fire suppression and oxygen systems<br>9) Supervise aircraft handling tasks, including parking, towing, marshalling, starting, refuelling, cleaning and de-icing.<br>10) Prepare and maintain aircraft documentation and statistical data |
| Level 2 | N/A | N/A | **<u>Structure Repair Technician</u>**<br>1) Inspect aircraft structures and related components<br>2) Restore or repair defects using unique aircraft fastening hardware, ferrous and non-ferrous materials, composite materials, chemicals, adhesives, paints and textiles<br>3) Manufacture and install aircraft structural components for prototype projects<br>4) Weld base metals, alloys and casting materials, using oxyacetylene, electrical arc, |

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (AVIONIC ELECTRICAL)** Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AVIONIC INSTRUMENTATION)** Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (STRUCTURE REPAIR)** Responsibilities May Includes |
|---|---|---|---|
| | | | inert gas and resistance welding techniques and equipment<br>5) Manufacture original aircraft equipment, components or replacement items from base metals using special cutting tools, engine lathe and milling machines<br>6) Fabricate and repair aircraft structures using composite, fibreglass, textiles, leather, plastic and synthetic components<br>7) Conduct corrosion control inspections of ferrous and non-ferrous materials<br>8) Maintain life support equipment, ejection seats, fire suppression and oxygen systems<br>9) Perform aircraft handling tasks, including parking, towing, marshalling, starting, refuelling, cleaning and de-icing.<br>10) Prepare and maintain aircraft documentation and statistical data |
| Level 1 | N/A | N/A | N/A |

Table 4.5l: List of Responsibilities for Group 331 according to NOSS Levelling (13 of 16)

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (AVIATION WELDING)** Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AIRCRAFT ENGINES – TURBINE)** Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AIRCRAFT ENGINES – ROTOCRAFT)** Responsibilities May Includes |
|---|---|---|---|
| Level 5 | **Aviation Welding Engineer**<br>1) Responsible for all "technical" aspects of welding<br>2) Design and develop new welding procedures or related process procedures that meet contract/customer requirements in a timely manner to support production schedules<br>3) Evaluate current welding procedures and make recommendations for improvements<br>4) Remain current in state-of-the art welding advancements/developments and incorporate techniques where appropriate<br>5) Ensure strict adherence to all contract/purchase order welding requirements<br>6) Provide technical expertise and consulting with respect to welding and metallurgy to all Engineered products<br>7) Select proper weld joint designs for new Engineered components<br>8) Ensures weld procedures meet Code and standards and customer expectations<br>9) Maintains knowledge of metallurgy of specialty materials, such as duplex stainless steels, Inconels, copper-nickels, high strength steels and titanium<br>10) Assigns weld procedures and reviews detailed "rework" instructions when weld repairs are required<br>11) Recommends changes to improve quality, reduce rework rate, and improve productivity<br>12) Ensures all welding meets Safety requirements (OSHA) | **Turbine Engine Maintenance Engineer**<br>1) Plan and coordinate turbine stock maintenance projects with the aim of improving the security, reliability, service, condition and comfort of the facilities.<br>2) Plan, coordinate and carry out projects relating to the installation of new trains and refurbishment.<br>3) Assist turbine stock depots, both providing technical support and helping to implement new projects.<br>4) Manage the work teams that perform maintenance on the turbine stock fleet.<br>5) Ensure that the train maintenance and installation procedures and guidelines established are properly adhered to both internally and by external suppliers.<br>6) Serve as the turbine stock expert when participating in technical projects led by other departments of the company.<br>7) Interpret information related to incidents or repairs and draw up reports that determine the state of the turbine stock fleet. To act on the basis of these reports, suggesting new projects with the aim of improving the state of the fleet. | **Rotocraft Engine Maintenance Engineer**<br>1) Plan and coordinate roll stock maintenance projects with the aim of improving the security, reliability, service, condition and comfort of the facilities.<br>2) Plan, coordinate and carry out projects relating to the installation of new trains and refurbishment.<br>3) Assist rotocraft stock depots, both providing technical support and helping to implement new projects.<br>4) Manage the work teams that perform maintenance on the rotocraft stock fleet.<br>5) Ensure that the train maintenance and installation procedures and guidelines established are properly adhered to both internally and by external suppliers.<br>6) Serve as the rotocraft stock expert when participating in technical projects led by other departments of the company.<br>7) Interpret information related to incidents or repairs and draw up reports that determine the state of the rotocraft stock fleet. To act on the basis of these reports, suggesting new projects with the aim of improving the state of the fleet. |

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (AVIATION WELDING)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AIRCRAFT ENGINES – TURBINE)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AIRCRAFT ENGINES – ROTOCRAFT)**<br>Responsibilities May Includes |
|---|---|---|---|
| | 13) Confers with company directors, managers, supervisors to coordinate welding activities<br>14) Prepare technical reports<br>15) Represent company when interfacing with the customer or vendors<br>16) Assist in providing welding expertise for proposals when required<br>17) Provides weld procedure and qualification cost and schedule estimates to support proposals and contract modifications. | | |
| Level 4 | **Aviation Welding Assistant Engineer**<br>1) Assist in design and develop new welding procedures or related process procedures that meet contract/customer requirements in a timely manner to support production schedules<br>2) Assist in evaluating current welding procedures and make recommendations for improvements<br>3) Ensure strict adherence to all contract/purchase order welding requirements<br>4) Assist in providing technical expertise and consulting with respect to welding and metallurgy to all Engineered products<br>5) Assist in selection of proper weld joint designs for new Engineered components<br>6) Ensures weld procedures meet Code and standards and customer expectations<br>7) Maintains knowledge of metallurgy of specialty materials, such as duplex stainless steels, Inconels, copper-nickels, high strength steels and titanium | **Turbine Engine Maintenance Assistant Engineer**<br>1) Assist in plan and coordinate roll stock maintenance projects with the aim of improving the security, reliability, service, condition and comfort of the facilities.<br>2) Assist in plan, coordinate and carry out projects relating to the installation of new trains and refurbishment.<br>3) Assist in providing technical support and helping to implement new projects.<br>4) Assist in perform maintenance on the turbine stock fleet.<br>5) Assist in train maintenance and installation procedures and guidelines established are properly adhered to both internally and by external suppliers.<br>6) Interpret information related to incidents or repairs and draw up reports that determine the state of the turbine stock fleet. To act on the basis of these reports, suggesting new projects with the aim of improving the state of | **Rotocraft Engine Maintenance Assistant Engineer**<br>1) Assist in plan and coordinate rotocraft stock maintenance projects with the aim of improving the security, reliability, service, condition and comfort of the facilities.<br>2) Assist in plan, coordinate and carry out projects relating to the installation of new trains and refurbishment.<br>3) Assist in providing technical support and helping to implement new projects.<br>4) Assist in perform maintenance on the rotocraft stock fleet.<br>5) Assist in train maintenance and installation procedures and guidelines established are properly adhered to both internally and by external suppliers.<br>6) Interpret information related to incidents or repairs and draw up reports that determine the state of the rotocraft stock fleet. To act on the basis of these reports, suggesting new projects with the aim of improving the state of |

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (AVIATION WELDING)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AIRCRAFT ENGINES – TURBINE)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AIRCRAFT ENGINES – ROTOCRAFT)**<br>Responsibilities May Includes |
|---|---|---|---|
| | 8) Assigns weld procedures and reviews detailed "rework" instructions when weld repairs are required<br>9) Assist in recommending changes to improve quality, reduce rework rate, and improve productivity<br>10) Ensures all welding meets Safety requirements (OSHA)<br>11) Assist in preparing technical reports<br>12) Represent company when interfacing with the customer or vendors<br>13) Assist in providing welding expertise for proposals when required<br>14) Assist in providing weld procedure and qualification cost and schedule estimates to support proposals and contract modifications | the fleet. | the fleet. |
| Level 3 | **<u>Aviation Welding Supervisor</u>**<br>1) Read and interpret project plans, blueprints and other written instructions and diagrams to perform task at hand<br>2) Supervise MIG, TIG and other types of weld based on project needs<br>3) Supervisor field install welds, including duct work, light fixtures, vents, fans, metal sheeting and other parts<br>4) Confirm proper fillers for jobs based on previous experience or project instructions<br>5) Supervise with field labor crew for efficient installations<br>6) Conserve resources whenever possible to ensure budgetary integrity and client satisfaction | **<u>Aircraft Engine Maintenance Supervisor</u>**<br>1) Supervise preventive and corrective maintenance activities and minor modifications on stock<br>2) Check and supervise routine vehicle inspections, inspecting parts for surface defects, changing of consumable items, perform minor repairs and technical cleaning;<br>3) Prepare maintenance scheduling<br>4) Check functional performance of electromechanical assemblies<br>5) Supervise operation of metalworking machines, repair, rework, and calibrate hydraulic and pneumatic assemblies and systems, verify dimensions and clearances of parts to ensure conformance to specifications | **<u>Aircraft Engine Maintenance Supervisor</u>**<br>1) Supervise preventive and corrective maintenance activities and minor modifications on stock<br>2) Check and supervise routine vehicle inspections, inspecting parts for surface defects, changing of consumable items, perform minor repairs and technical cleaning;<br>3) Prepare maintenance scheduling<br>4) Check functional performance of electromechanical assemblies<br>5) Supervise operation of metalworking machines, repair, rework, and calibrate hydraulic and pneumatic assemblies and systems, verify dimensions and clearances of parts to ensure conformance to specifications |

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (AVIATION WELDING)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AIRCRAFT ENGINES – TURBINE)**<br>Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AIRCRAFT ENGINES – ROTOCRAFT)**<br>Responsibilities May Includes |
|---|---|---|---|
| | 7) De-bur and grind metal as necessary to achieve proper surface texture | and to meet operational specifications and tolerances;<br>6) Supervise time sensitive fault diagnostics and component replacement (repair in site or inside depot) on the stock;<br>7) Follow the appropriate maintenance procedures and instructions, operating rules and procedures to ensure compliance with the required requirements;<br>8) Check wheel truing of the stock annually or as required<br>9) Implement complex systems or new projects;<br>10) Check maintenance records | and to meet operational specifications and tolerances;<br>6) Supervise time sensitive fault diagnostics and component replacement (repair in site or inside depot) on the stock;<br>7) Follow the appropriate maintenance procedures and instructions, operating rules and procedures to ensure compliance with the required requirements;<br>8) Check wheel truing of the stock annually or as required<br>9) Implement complex systems or new projects;<br>10) Check maintenance records |
| Level 2 | **Aviation Welder**<br>1) Read and interpret project plans, blueprints and other written instructions and diagrams to perform task at hand<br>2) Perform MIG, TIG and other types of weld based on project needs<br>3) Field install welds, including duct work, light fixtures, vents, fans, metal sheeting and other parts<br>4) Select proper fillers for jobs based on previous experience or project instructions<br>5) Coordinate with field labor crew for efficient installations<br>6) Conserve resources whenever possible to ensure budgetary integrity and client satisfaction<br>7) De-bur and grind metal as necessary to achieve proper surface texture | **Aircraft Engine Maintenance Technician**<br>1) Assist the supervisor in carrying out all level of preventive and corrective maintenance activities and minor modifications on stock including passenger service vehicles, engineering support vehicles, shunting vehicles and wagons;<br>2) Carry out routine vehicle inspections, inspecting parts for surface defects, changing of consumable items, perform minor repairs and technical cleaning;<br>3) Perform roles necessary for the management of the safe system of works, including to meet tight maintenance schedules;<br>4) Test functional performance of electromechanical assemblies using various test instruments, replace, install electrical and electronic parts and hardware in housings or assemblies, align, fit, and assemble | **Aircraft Engine Maintenance Technician**<br>1) Assist the supervisor in carrying out all level of preventive and corrective maintenance activities and minor modifications on stock including passenger service vehicles, engineering support vehicles, shunting vehicles and wagons;<br>2) Carry out routine vehicle inspections, inspecting parts for surface defects, changing of consumable items, perform minor repairs and technical cleaning;<br>3) Perform roles necessary for the management of the safe system of works, including to meet tight maintenance schedules;<br>4) Test functional performance of electromechanical assemblies using various test instruments, replace, install electrical and electronic parts and hardware in housings or assemblies, align, fit, and assemble |

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (AVIATION WELDING)** Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AIRCRAFT ENGINES – TURBINE)** Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AIRCRAFT ENGINES – ROTOCRAFT)** Responsibilities May Includes |
|---|---|---|---|
| | | component parts, using electronics tools, hand tools, power tools, fixtures, templates, and microscopes;<br>5) Operate metalworking machines, repair, rework, and calibrate hydraulic and pneumatic assemblies and systems, verify dimensions and clearances of parts to ensure conformance to specifications and to meet operational specifications and tolerances;<br>6) Perform time sensitive fault diagnostics and component replacement (repair in site or inside depot) on the stock;<br>7) Follow the appropriate maintenance procedures and instructions, operating rules and procedures to ensure compliance with the required requirements;<br>8) Carry out wheel truing of the stock annually or as required using under-floor wheel lathe, perform bogie overhaul at every four and eight years by inspecting and repairing major bogie components such as traction motors, gear-boxes, wheel-sets, and axle boxes in special purpose-built workshops;<br>9) Assist the supervisor and/ or other technical support staff to implement complex systems or new projects;<br>10) Produce and maintain accurate maintenance records of stock, tools and plant machinery performance, work accomplished and other information using a computerized maintenance management system;<br>11) Implement and follow Permit to Work process;<br>12) Perform shift and emergency duties when | component parts, using electronics tools, hand tools, power tools, fixtures, templates, and microscopes;<br>5) Operate metalworking machines, repair, rework, and calibrate hydraulic and pneumatic assemblies and systems, verify dimensions and clearances of parts to ensure conformance to specifications and to meet operational specifications and tolerances;<br>6) Perform time sensitive fault diagnostics and component replacement (repair in site or inside depot) on the stock;<br>7) Follow the appropriate maintenance procedures and instructions, operating rules and procedures to ensure compliance with the required requirements;<br>8) Carry out wheel truing of the stock annually or as required using under-floor wheel lathe, perform bogie overhaul at every four and eight years by inspecting and repairing major bogie components such as traction motors, gear-boxes, wheel-sets, and axle boxes in special purpose-built workshops;<br>9) Assist the supervisor and/ or other technical support staff to implement complex systems or new projects;<br>10) Produce and maintain accurate maintenance records of stock, tools and plant machinery performance, work accomplished and other information using a computerized maintenance management system;<br>11) Implement and follow Permit to Work process;<br>12) Perform shift and emergency duties when |

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (AVIATION WELDING)** Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AIRCRAFT ENGINES – TURBINE)** Responsibilities May Includes | **REPAIR OF TRANSPORT EQUIPMENT (AIRCRAFT ENGINES – ROTOCRAFT)** Responsibilities May Includes |
|---|---|---|---|
| | | required. | required. |
| Level 1 | N/A | N/A | N/A |

Table 4.5m: List of Responsibilities for Group 331 according to NOSS Levelling (14 of 16)

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (ANIMAL DRAWN BUGGIES AND WAGONS)**<br>Responsibilities May Includes | **REPAIR OF OTHER EQUIPMENT (ORGANS AND OTHER HISTORICAL MUSICAL INSTRUMENTS)**<br>Responsibilities May Includes |
|---|---|---|
| Level 5 | N/A | N/A |
| Level 4 | N/A | N/A |
| Level 3 | **Animal Drawn Buggies and Wagons Maintenance Supervisor**<br>1) Supervise minor animal-drawn carriage maintenance<br>2) Touch up paint on carriages (mainly wheels and fenders) to hide scuffs<br>3) Supervise on maintaining electric fence ("hot wire") to secure horse pasture<br>4) Supervise on repairing broken gates around the property<br>5) Supervise on fixing minor leaks in plumbing or hoses<br>6) Supervise on replacing or repairing stall boards<br>7) Heavy lifting and junk removal<br>8) Brush cutting/weed wacking (spring/summer)<br>9) Snow shoveling and salting (winter) | **Musical Instrument Maintenance Supervisor**<br>1) Maintain in proper repair all woodwind, brass, string and percussion instruments in the School of Music;<br>2) Perform routine maintenance of all school-owned instruments;<br>3) Maintain records and files and prepare reports each academic calendar block regarding the same.<br>4) Manage the inventory and records of all woodwind, string, brass and percussion instruments, instrument storage cabinets, and video equipment, and other miscellaneous music equipment.<br>5) Maintain the inventory of parts and supplies; order new parts when necessary; make recommendations to faculty concerning purchase of new and replacement parts, tools and instruments. Prepare related annual operating and capital budget requests.<br>6) Oversee the maintenance and repair of other non-musical instruments such as video cameras and other video equipment.<br>7) Liaise with other departments regarding major repair needs and Instrumental Repair Shop needs.<br>8) Develop and demonstrate a multicultural awareness and contribute to cultivating an inclusive, diverse and respectful College community.<br>9) Develop and maintain cooperative working relationship with faculty, students, vendors, and others associated with the School of Music in regard to school-owned instruments.<br>10) Select, train, and supervise student assistants.<br>11) Assist in ensuring security of instruments and equipment.<br>12) Teach instrument repair courses and independent studies each academic year.<br>13) Maintain membership in professional repair organizations, and participate in related activities. |

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (ANIMAL DRAWN BUGGIES AND WAGONS)**<br>Responsibilities May Includes | **REPAIR OF OTHER EQUIPMENT (ORGANS AND OTHER HISTORICAL MUSICAL INSTRUMENTS)**<br>Responsibilities May Includes |
|---|---|---|
| Level 2 | **<u>Animal Drawn Buggies and Wagons Technician</u>**<br>1) Minor animal-drawn carriage maintenance<br>2) Touch up paint on carriages (mainly wheels and fenders) to hide scuffs<br>3) Maintaining electric fence ("hot wire") to secure horse pasture<br>4) Repairing broken gates around the property<br>5) Fixing minor leaks in plumbing or hoses<br>6) Replacing or repairing stall boards<br>7) Heavy lifting and junk removal<br>8) Brush cutting/weed wacking (spring/summer)<br>9) Snow shoveling and salting (winter) | **<u>Musical Instrument Maintenance Technician</u>**<br>1) Maintain in proper repair all woodwind, brass, string and percussion instruments in the School of Music; perform routine maintenance of all school-owned instruments; maintain records and files and prepare reports each academic calendar block regarding the same.<br>2) Manage the inventory and records of all woodwind, string, brass and percussion instruments, instrument storage cabinets, and video equipment, and other miscellaneous music equipment.<br>3) Maintain the inventory of parts and supplies; order new parts when necessary; make recommendations to faculty concerning purchase of new and replacement parts, tools and instruments. Prepare related annual operating and capital budget requests.<br>4) Maintenance and repair of other non-musical instruments such as video cameras and other video equipment.<br>5) To assist developing and demonstrate a multicultural awareness and contribute to cultivating an inclusive, diverse and respectful College community.<br>6) To check the day-to-day needs of the Instrumental Repair Shop and student workers including issuance of all student lockers and locks, issuance and collection of instruments, the check-out system<br>7) To train student assistants.<br>8) Assist in ensuring security of instruments and equipment.<br>9) Teach instrument repair courses and independent studies each academic year.<br>10) Maintain membership in professional repair organizations, and participate in related activities in consultation with the Associate Dean.<br>11) Work on rental returned instruments in an efficient and timely manner ensuring each instrument is repaired according to established quality guidelines.<br>12) Maintain accurate records for production reporting.<br>13) Additional duties as assigned. |

| AREA | **REPAIR OF TRANSPORT EQUIPMENT (ANIMAL DRAWN BUGGIES AND WAGONS)**<br>Responsibilities May Includes | **REPAIR OF OTHER EQUIPMENT (ORGANS AND OTHER HISTORICAL MUSICAL INSTRUMENTS)**<br>Responsibilities May Includes |
|---|---|---|
| Level 1 | N/A | N/A |

**Division: C-33 Repair of Machinery and Equipment**
**Group: 332 - INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT**

Table 4.6: List of Responsibilities for Group 332 according to NOSS Levelling (15 of 16)

| AREA | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (HYDRAULIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (PNEUMATIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 6 | **Hydraulic System Specialist**<br>1) Assist the superintendent and/or solve the hydraulic system related problems and failures on board of the equipment in the day to day fleet operations.<br>2) Provide on request optimal technical support in case of equipment malfunctioning.<br>3) Spot problems/risks and carry out checks on the control systems/applications, thereby identifying possible sources of malfunctioning risks or incorrect use promptly and avoiding problems.<br>4) Assist to ensure that the hydraulic equipment is being maintained to the company standards and the certifying authorities.<br>5) Offer technical and managing support between the hydraulic suppliers and other disciplines to the project managers or superintendents during the project execution phase in order to achieve the best possible project result.<br>6) Attend commissioning's or commissions hydraulic installations in consultation with the relevant people.<br>7) Attend the Factory Acceptance Test (FAT) and the Site Acceptance Test (SAT).<br>8) Process diagrams, drawings and documentation. | **Hydraulic System Specialist**<br>1) Load and Motion Analysis. Solving formulas for torque, speed and horsepower for cylinder & air motor driven systems.<br>2) Solves for the reaction forces on a cylinder rod bearing.<br>3) Computes cylinder bore and pressure to move loads with a friction factor.<br>4) Solves for the pressure and suction area to provide the required lifting force using vacuum cups.<br>5) Understands Vacuum generators.<br>6) Provides ISO cleanliness level for system(s)<br>7) Specifies filtration products to maintain ISO cleanliness.<br>8) Specifies flushing and commissioning procedures.<br>9) Calculates air cylinder velocity.<br>10) Selects and sizes conductors based on pressure and flow requirements.<br>11) Computes the necessary CFM airflow and pressure to power a cylinder.<br>12) Computes the necessary CFM airflow and pressure to power an air motor.<br>13) Can calculate and select the proper air over oil intensifier.<br>14) Calculate the kinetic energy required to stop a load with a shock absorber. | **Electrical System Specialist**<br>1) Troubleshoot the most difficult instrumentation and electrical problems in the refinery.<br>2) Prepare conceptual idea for final project documentation<br>3) Provide equipment specifications and equipment<br>4) Interpret electrical prints and make up new circuit design changes.<br>5) Capability to install, remove, trouble shoot and repair plant equipment having electrical controls, motors, meter, telephones layout and make up control panels and boxes.<br>6) Capability and knowledge of hydraulic, pneumatic and mechanical repair. |

| AREA | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (HYDRAULIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (PNEUMATIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| | | 15) Calculate the CV flow factor for an air valve.<br>16) Understands critical (sonic) velocity and how to calculate it.<br>17) Calculate the required compressor delivery capacity for system demand<br>18) Understands ladder logic.<br>19) Uses Ohm's law and Kirchhoff's law to solve series-parallel circuits for voltage, current, and resistance.<br>20) Matches appropriate wiring arrangements between PLC's and directional control valves.<br>21) Can do system trouble shooting.<br>22) Able to do compressed air audits.<br>23) Promotes safe working conditions with pressurized systems. | |
| Level 5 | **Hydraulic Maintenance Engineer**<br>1) Manage all hydraulic equipment to prepare all bid proposals and design all hydraulic systems according to contract specifications and prepare prices for all diagrams.<br>2) Prepare all procurement specifications and prepare all technical procedures and bill of materials and provide support to all material requirements and review all designs to improve performance.<br>3) Perform research on new technology to develop new products and assist to prepare all prototype and ensure utilisation of all engineering tools for various projects.<br>4) Manage efficient communication with all internal and external customers and suppliers and resolve all technical issues and prepare | **Hydraulic Maintenance Engineer**<br>1) Manage all pneumatic equipment to prepare all bid proposals and design all pneumatic systems according to contract specifications and prepare prices for all diagrams.<br>2) Prepare all procurement specifications and prepare all technical procedures and bill of materials and provide support to all material requirements and review all designs to improve performance.<br>3) Perform research on new technology to develop new products and assist to prepare all prototype and ensure utilisation of all engineering tools for various projects.<br>4) Manage efficient communication with all | **Electrical Maintenance Engineer**<br>1) Evaluates electrical systems, products, components, and applications by designing and conducting research programs; applying knowledge of electricity and materials.<br>2) Confirms system's and components' capabilities by designing testing methods; testing properties.<br>3) Develops electrical products by studying customer requirements; researching and testing manufacturing and assembly methods and materials.<br>4) Develops manufacturing processes by designing and modifying equipment for building and assembling electrical |

| AREA | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (HYDRAULIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (PNEUMATIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| | drafts for all engineering projects and recommend change proposals.<br>5) Monitor efficient working of all hydraulic equipment and perform troubleshoot on same and provide support to all process engineers and make required adjustments.<br>6) Analyse all equipment designs and recommend improvement and implement same and prepare all formal and informal training for all personnel.<br>7) Evaluate all performance requirements according to customer specifications and prepare all required documents and perform tests on all sales and customers and provide resolution according to standard products.<br>8) Administer all specification for all orders and evaluate all test results and monitor all contract performance and maintain and improve all test logs and recommend improvement to all information and maintain accuracy of all projects.<br>9) Manage all communication with team work and ensure adherence to corporate standards and prepare designs of all hydraulic equipment according to assemble requirements. | internal and external customers and suppliers and resolve all technical issues and prepare drafts for all engineering projects and recommend change proposals.<br>5) Monitor efficient working of all pneumatic equipment and perform troubleshoot on same and provide support to all process engineers and make required adjustments.<br>6) Analyse all equipment designs and recommend improvement and implement same and prepare all formal and informal training for all personnel.<br>7) Evaluate all performance requirements according to customer specifications and prepare all required documents and perform tests on all sales and customers and provide resolution according to standard products.<br>8) Administer all specification for all orders and evaluate all test results and monitor all contract performance and maintain and improve all test logs and recommend improvement to all information and maintain accuracy of all projects.<br>9) Manage all communication with team work and ensure adherence to corporate standards and prepare designs of all hydraulic equipment according to assemble requirements. | components; soliciting observations from operators.<br>5) Assures product quality by designing electrical testing methods; testing finished products and system capabilities.<br>6) Prepares product reports by collecting, analysing, and summarising information and trends.<br>7) Provides engineering information by answering questions and requests.<br>8) Maintains product and company reputation by complying with federal and state regulations.<br>9) Keeps equipment operational by following manufacturer's instructions and established procedures; requesting repair service.<br>10) Maintains product data base by writing computer programs; entering data.<br>11) Completes projects by training and guiding technicians.<br>12) Maintains professional and technical knowledge by attending educational workshops; reviewing professional publications; establishing personal networks; participating in professional societies.<br>Contributes to team effort by accomplishing related results as needed. |

| AREA | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (HYDRAULIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (PNEUMATIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 4 | **Hydraulic Maintenance Assistant Engineer**<br>1) Assist in managing all hydraulic equipment to prepare all bid proposals and design all hydraulic systems according to contract specifications and prepare prices for all diagrams.<br>2) Assist in preparing all procurement specifications and prepare all technical procedures and bill of materials and provide support to all material requirements and review all designs to improve performance.<br>3) Assist in performing research on new technology to develop new products and assist to prepare all prototype and ensure utilisation of all engineering tools for various projects.<br>4) Assist in managing efficient communication with all internal and external customers and suppliers and resolve all technical issues and prepare drafts for all engineering projects and recommend change proposals.<br>5) Assist in monitoring efficient working of all hydraulic equipment and perform troubleshoot on same and provide support to all process engineers and make required adjustments.<br>6) Assist in analysing all equipment designs and recommend improvement and implement same and prepare all formal and informal training for all personnel.<br>7) Assist in evaluating all performance requirements according to customer specifications and prepare all required documents and perform tests on all sales and | **Pneumatic Maintenance Assistant Engineer**<br>1) Assist in managing all pneumatic equipment to prepare all bid proposals and design all pneumatic systems according to contract specifications and prepare prices for all diagrams.<br>2) Assist in preparing all procurement specifications and prepare all technical procedures and bill of materials and provide support to all material requirements and review all designs to improve performance.<br>3) Assist in performing research on new technology to develop new products and assist to prepare all prototype and ensure utilisation of all engineering tools for various projects.<br>4) Assist in managing efficient communication with all internal and external customers and suppliers and resolve all technical issues and prepare drafts for all engineering projects and recommend change proposals.<br>5) Assist in monitoring efficient working of all pneumatic equipment and perform troubleshoot on same and provide support to all process engineers and make required adjustments.<br>6) Assist in analysing all equipment designs and recommend improvement and implement same and prepare all formal and informal training for all personnel.<br>7) Assist in evaluating all performance requirements according to customer specifications and prepare all required | **Electrical Maintenance Engineer**<br>1) Evaluates electrical systems, products, components, and applications by designing and conducting research programs; applying knowledge of electricity and materials.<br>2) Confirms system's and components' capabilities by designing testing methods; testing properties.<br>3) Develops electrical products by studying customer requirements; researching and testing manufacturing and assembly methods and materials.<br>4) Develops manufacturing processes by designing and modifying equipment for building and assembling electrical components; soliciting observations from operators.<br>5) Assures product quality by designing electrical testing methods; testing finished products and system capabilities.<br>6) Prepares product reports by collecting, analysing, and summarising information and trends.<br>7) Provides engineering information by answering questions and requests.<br>8) Maintains product and company reputation by complying with federal and state regulations.<br>9) Keeps equipment operational by following manufacturer's instructions and established procedures; requesting repair service.<br>10) Maintains product data base by writing computer programs; entering data.<br>11) Completes projects by training and guiding |

| AREA | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (HYDRAULIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (PNEUMATIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| | customers and provide resolution according to standard products.<br>8) Assist in administering all specification for all orders and evaluate all test results and monitor all contract performance and maintain and improve all test logs and recommend improvement to all information and maintain accuracy of all projects.<br>9) Assist in managing all communication with team work and ensure adherence to corporate standards and prepare designs of all hydraulic equipment according to assemble requirements. | documents and perform tests on all sales and customers and provide resolution according to standard products.<br>8) Assist in administering all specification for all orders and evaluate all test results and monitor all contract performance and maintain and improve all test logs and recommend improvement to all information and maintain accuracy of all projects.<br>9) Assist in managing all communication with team work and ensure adherence to corporate standards and prepare designs of all pneumatic equipment according to assemble requirements. | technicians.<br>12) Maintains professional and technical knowledge by attending educational workshops; reviewing professional publications; establishing personal networks; participating in professional societies.<br>13) Contributes to team effort by accomplishing related results as needed. |
| Level 3 | **Hydraulic Maintenance Supervisor**<br>1) Check tools, equipment and component for assembly work<br>2) Determine instructions and working procedure<br>3) Comply with company safety, rules & regulations<br>4) Supervise assembly works<br>5) Determine technical findings at progress capture form<br>6) Support cost reductions program counter measure for assembly hydraulic<br>7) Supervise installation works, repair works and maintaining hydraulic equipment and machinery<br>8) Supervise maintenance activities<br>9) Check test units for performing equipment | **Pneumatic Maintenance Supervisor**<br>1) Supervise repairing pneumatic components in the facilities or outside<br>2) Supervise assembling fabricated parts at floor stations<br>3) Use hand tools and power tools for assembling<br>4) Supervise testing and calibration parts and mechanisms to meet product specifications<br>5) Check units that fail tests or tolerance levels and repairs<br>6) Keep updated on technological advancements in the area | **Electrical Maintenance Supervisor**<br>1) Supervise assembling works, installation, testing, and maintaining electrical or electronic wiring, equipment, appliances, apparatus, and fixtures, using hand tools and power tools.<br>2) Supervise diagnosing malfunctioning systems, apparatus, and components, using test equipment and hand tools, to locate the cause of a breakdown and correct the problem.<br>3) Supervise connecting wires to circuit breakers, transformers, or other components.<br>4) Supervise inspecting electrical systems, equipment, and components to identify hazards, defects, and the need for adjustment or repair, and to ensure compliance with |

| AREA | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (HYDRAULIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (PNEUMATIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| | tests<br>10) Check tests procedures and results<br>11) Ensure the project follows established guidelines<br>12) Diagnostically troubleshoot component defects<br>13) Supervise corrective action activities<br>14) Liaise with relevant department | | codes.<br>5) Advise management on whether continued operation of equipment could be hazardous.<br>6) Supervise testing electrical systems and continuity of circuits in electrical wiring, equipment, and fixtures, using testing devices such as ohmmeters, voltmeters, and oscilloscopes, to ensure compatibility and safety of system.<br>7) Supervise plan layout and installation of electrical wiring, equipment and fixtures, based on job specifications and local codes.<br>8) Check sketches or follow blueprints to determine the location of wiring and equipment and to ensure conformance to building and safety codes.<br>9) Use a variety of tools and equipment such as power construction equipment, measuring devices, power tools, and testing equipment including oscilloscopes, ammeters, and test lamps.<br>10) Supervise repairing or replacing wiring, equipment, and fixtures, using hand tools and power tools. |
| Level 2 | **Hydraulic Maintenance Technician**<br>1) Prepare tools, equipment and component for assembly work<br>2) Determine instructions and working procedure<br>3) Comply with company safety, rules & regulations<br>4) Carry out assembly works | **Pneumatic Maintenance Technician**<br>1) Repair pneumatic components in the facilities or outside<br>2) Assemble fabricated parts at floor stations<br>3) Use hand tools and power tools for assembling<br>4) Test and calibrate parts and mechanisms to meet product specifications | **Electrical Maintenance Technician**<br>1) Assemble, install, test, and maintain electrical or electronic wiring, equipment, appliances, apparatus, and fixtures, using hand tools and power tools.<br>2) Diagnose malfunctioning systems, apparatus, and components, using test equipment and hand tools, to locate the cause of a |

| AREA | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (HYDRAULIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (PNEUMATIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRICAL)**<br>Responsibilities May Includes |
|---|---|---|---|
| | 5) Identify technical findings at progress capture form<br>6) Support cost reductions program counter measure for assembly hydraulic<br>7) Install, repair and maintain hydraulic equipment and machinery<br>8) Carry out maintenance activities<br>9) Set up test units for performing equipment tests<br>10) Record tests procedures and results<br>11) Ensure the project follows established guidelines<br>12) Diagnostically troubleshoot component defects<br>13) Carry out corrective action<br>14) Report any safety, risk or paper discrepancies to superior | 5) Identify units that fail tests or tolerance levels and repairs<br>6) Keep updated on technological advancements in the area | breakdown and correct the problem.<br>3) Connect wires to circuit breakers, transformers, or other components.<br>4) Inspect electrical systems, equipment, and components to identify hazards, defects, and the need for adjustment or repair, and to ensure compliance with codes.<br>5) Advise management on whether continued operation of equipment could be hazardous.<br>6) Test electrical systems and continuity of circuits in electrical wiring, equipment, and fixtures, using testing devices such as ohmmeters, voltmeters, and oscilloscopes, to ensure compatibility and safety of system.<br>7) Plan layout and installation of electrical wiring, equipment and fixtures, based on job specifications and local codes.<br>8) Prepare sketches or follow blueprints to determine the location of wiring and equipment and to ensure conformance to building and safety codes.<br>9) Use a variety of tools and equipment such as power construction equipment, measuring devices, power tools, and testing equipment including oscilloscopes, ammeters, and test lamps.<br>10) Repair or replace wiring, equipment, and fixtures, using hand tools and power tools. |
| Level 1 | N/A | N/A | N/A |

Table 4.6a: List of Responsibilities for Group 332 according to NOSS Levelling (16 of 16)

| AREA | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRONIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHANICAL)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 6 | **Electronic System Specialist**<br>1) Troubleshoot the most difficult instrumentation and electronic problems in the refinery.<br>2) Prepare conceptual idea for final project documentation<br>3) Provide equipment specifications and equipment<br>4) Interpret electronic prints and make up new circuit design changes.<br>5) Capability to install, remove, trouble shoot and repair plant equipment having electronic controls, motors, meter, telephones layout and make up control panels and boxes.<br>6) Capability and knowledge of hydraulic, pneumatic and mechanical repair. | **Mechanical System Specialist**<br>1) Endorse mechanical and electromechanical systems and products<br>2) Evaluate system and product capabilities by designing feasibility and testing methods<br>3) Prepare conceptual design for mechanical system<br>4) Develops manufacturing processes by designing and modifying equipment for fabricating, building, assembling, and installing components.<br>5) Assures system and product quality by designing testing methods; testing finished-product and system capabilities; confirming fabrication, assembly, and installation processes.<br>6) Provides engineering information by answering questions and requests.<br>7) Maintains product and company reputation by complying with government regulations.<br>8) Maintains system and product data base by writing computer programs and entering data.<br>9) Maintains professional and technical knowledge by attending educational workshops; reviewing professional publications; establishing personal networks; participating in professional societies. | **Mechatronic System Specialist**<br>1) Endorse design engineering systems for the automation of industrial tasks.<br>2) Create mechanical design documents for parts, assemblies, or finished products.<br>3) Design advanced electronic control systems for mechanical systems.<br>4) Maintain technical project files.<br>5) Create embedded software design programs.<br>6) Analyse existing development or manufacturing procedures and suggest improvements.<br>7) Endorse design solutions implementation and testing.<br>8) Evaluate simulation mechatronic design concepts.<br>9) Upgrade the design of existing devices by adding mechatronic elements.<br>10) Design advanced precision equipment for accurate or controlled applications.<br>11) Research, select, or apply sensors, communication technologies, or control devices for motion control, position sensing, pressure sensing, or electronic communication.<br>12) Design, develop, or implement control circuits or algorithms for electromechanical or pneumatic devices or systems.<br>13) Monitor or calibrate automated systems, industrial control systems, or system components to maximize efficiency of |

| AREA | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRONIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHANICAL)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| | | | production. |
| Level 5 | **Electronic Maintenance Engineer**<br>1) Review or prepare budget and cost estimates for equipment, construction, and installation projects, and control expenditures.<br>2) Represent employer at conferences, meetings, boards, panels, committees, and working groups to present, explain, and defend findings and recommendations, negotiate compromises and agreements and exchange information.<br>3) Design electronic components and software, products and systems for commercial, industrial, medical, military, and scientific applications.<br>4) Provide technical support and instruction to staff and customers regarding equipment standards, and help solve specific, difficult in-service engineering problems.<br>5) Operate computer-assisted engineering and design software and equipment to perform engineering tasks.<br>6) Analyse system requirements, capacity, cost, and customer needs to determine feasibility of project and develop system plan.<br>7) Confer with engineers, customers, vendors and others to discuss existing and potential engineering projects or products.<br>8) Review and evaluate work of others, inside and outside the organization, to ensure effectiveness, technical adequacy and compatibility in the resolution of complex engineering problems. | **Mechanical Maintenance Engineer**<br>1) Evaluates mechanical and electromechanical systems and products by designing and conducting research programs; applying principles of mechanics, thermodynamics, hydraulics, heat transfer, and materials.<br>2) Confirms system and product capabilities by designing feasibility and testing methods; testing properties.<br>3) Develops mechanical and electromechanical products by studying customer requirements; researching and testing manufacturing and assembly methods and materials; soliciting observations from operators.<br>4) Develops manufacturing processes by designing and modifying equipment for fabricating, building, assembling, and installing components.<br>5) Assures system and product quality by designing testing methods; testing finished-product and system capabilities; confirming fabrication, assembly, and installation processes.<br>6) Prepares product reports by collecting, analysing, and summarising information and trends.<br>7) Provides engineering information by answering questions and requests.<br>8) Maintains product and company reputation by complying with government regulations.<br>9) Keeps equipment operational by coordinating maintenance and repair services; following | **Mechatronic Maintenance Engineer**<br>1) Oversee the work of contractors in accordance with project requirements.<br>2) Design engineering systems for the automation of industrial tasks.<br>3) Create mechanical design documents for parts, assemblies, or finished products.<br>4) Design advanced electronic control systems for mechanical systems.<br>5) Maintain technical project files.<br>6) Create embedded software design programs.<br>7) Analyse existing development or manufacturing procedures and suggest improvements.<br>8) Implement or test design solutions.<br>9) Identify and select materials appropriate for mechatronic system designs.<br>10) Create mechanical models and tolerance analyses to simulate mechatronic design concepts.<br>11) Upgrade the design of existing devices by adding mechatronic elements.<br>12) Design advanced precision equipment for accurate or controlled applications.<br>13) Publish engineering reports documenting design details or qualification test results.<br>14) Provide consultation or training on topics such as mechatronics or automated control.<br>15) Research, select, or apply sensors, communication technologies, or control devices for motion control, position sensing, pressure sensing, or electronic |

| AREA | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRONIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHANICAL)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| | 9) Determine material and equipment needs and order supplies.<br>10) Inspect electronic equipment, instruments, products, and systems to ensure conformance to specifications, safety standards, and applicable codes and regulations.<br>11) Evaluate operational systems, prototypes and proposals and recommend repair or design modifications based on factors such as environment, service, cost, and system capabilities.<br>12) Prepare documentation containing information such as confidential descriptions and specifications of proprietary hardware and software, product development and introduction schedules, product costs, and information about product performance weaknesses.<br>13) Direct and coordinate activities concerned with manufacture, construction, installation, maintenance, operation, and modification of electronic equipment, products, and systems.<br>14) Plan and develop applications and modifications for electronic properties used in components, products, and systems, to improve technical performance.<br>15) Prepare engineering sketches and specifications for construction, relocation, and installation of equipment, facilities, products, and systems.<br>16) Plan and implement research, methodology, and procedures to apply principles of | manufacturer's instructions and established procedures; requesting special services.<br>10) Maintains system and product data base by writing computer programs and entering data.<br>11) Maintains professional and technical knowledge by attending educational workshops; reviewing professional publications; establishing personal networks; participating in professional societies.<br>12) Contributes to team effort by accomplishing related results as needed. | communication.<br>16) Design, develop, or implement control circuits or algorithms for electromechanical or pneumatic devices or systems.<br>17) Conduct studies to determine the feasibility, costs, or performance benefits of new mechatronic equipment.<br>18) Develop electronic, mechanical, or computerized processes to perform tasks in dangerous situations, such as underwater exploration or extra-terrestrial mining. Design mechatronics components for computer-controlled products, such as cameras, video recorders, automobiles, or airplanes.<br>19) Design or develop automated control systems for environmental applications, such as waste processing, air quality, or water quality systems.<br>20) Design self-monitoring mechanical systems, such as gear systems that monitor loading or condition of systems to detect and prevent failures.<br>21) Monitor or calibrate automated systems, industrial control systems, or system components to maximize efficiency of production. |

| AREA | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRONIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHANICAL)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| | electronic theory to engineering projects.<br>17) Prepare, review, and maintain maintenance schedules, design documentation and operational reports and charts. | | |
| Level 4 | **Electronic Maintenance Assistant Engineer**<br>1) Assist in reviewing or preparing budget and cost estimates for equipment, construction, and installation projects, and control expenditures.<br>2) Assist in designing electronic components and software, products and systems for commercial, industrial, medical, military, and scientific applications.<br>3) Assist in providing technical support and instruction to staff and customers regarding equipment standards, and help solve specific, difficult in-service engineering problems.<br>4) Assist in operating computer-assisted engineering and design software and equipment to perform engineering tasks.<br>5) Assist in analysing system requirements, capacity, cost, and customer needs to determine feasibility of project and develop system plan.<br>6) Liaise with other relevant department<br>7) Assist in reviewing and evaluating work of others, inside and outside the organization, to ensure effectiveness, technical adequacy and compatibility in the resolution of complex engineering problems.<br>8) Determine material and equipment needs and order supplies. | **Mechanical Maintenance Assistant Engineer**<br>1) Assist in evaluating mechanical and electromechanical systems and products by designing and conducting research programs; applying principles of mechanics, thermodynamics, hydraulics, heat transfer, and materials.<br>2) Assist in developing mechanical and electromechanical products by studying customer requirements; researching and testing manufacturing and assembly methods and materials; soliciting observations from operators.<br>3) Assist in developing manufacturing processes by designing and modifying equipment for fabricating, building, assembling, and installing components.<br>4) Assist in assuring system and product quality by designing testing methods; testing finished- product and system capabilities; confirming fabrication, assembly, and installation processes.<br>5) Assist in preparing product reports by collecting, analysing, and summarising information and trends.<br>6) Assist in providing engineering information by answering questions and requests.<br>7) Maintains product and company reputation by | **Mechatronic Maintenance Assistant Engineer**<br>1) Oversee the work of contractors in accordance with project requirements.<br>2) Assist in designing engineering systems for the automation of industrial tasks.<br>3) Assist in creating mechanical design documents for parts, assemblies, or finished products.<br>4) Assist in designing advanced electronic control systems for mechanical systems.<br>5) Maintain technical project files.<br>6) Assist in creating embedded software design programs.<br>7) Assist in analysing existing development or manufacturing procedures and suggest improvements.<br>8) Identify and select materials appropriate for mechatronic system designs.<br>9) Assist in creating mechanical models and tolerance analyses to simulate mechatronic design concepts.<br>10) Assist in publishing engineering reports documenting design details or qualification test results.<br>11) Assist in providing consultation or training on topics such as mechatronics or automated control.<br>12) Assist in researching, selecting, or applying |

| AREA | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRONIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHANICAL)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| | 9) Assist in inspecting electronic equipment, instruments, products, and systems to ensure conformance to specifications, safety standards, and applicable codes and regulations.<br>10) Assist in evaluating operational systems, prototypes and proposals and recommend repair or design modifications based on factors such as environment, service, cost, and system capabilities.<br>11) Assist in preparing documentation containing information such as confidential descriptions and specifications of proprietary hardware and software, product development and introduction schedules, product costs, and information about product performance weaknesses.<br>12) Assist in planning and developing applications and modifications for electronic properties used in components, products, and systems, to improve technical performance.<br>13) Assist in preparing engineering sketches and specifications for construction, relocation, and installation of equipment, facilities, products, and systems.<br>14) Assist in preparing, reviewing, and maintaining maintenance schedules, designing documentation and operational reports and charts. | complying with government regulations.<br>8) Keeps equipment operational by coordinating maintenance and repair services; following manufacturer's instructions and established procedures; requesting special services.<br>9) Maintains system and product data base by writing computer programs and entering data.<br>10) Contributes to team effort by accomplishing related results as needed. | sensors, communication technologies, or control devices for motion control, position sensing, pressure sensing, or electronic communication.<br>13) Assist in designing, developing, or implementing control circuits or algorithms for electromechanical or pneumatic devices or systems.<br>14) Assist in conducting studies to determine the feasibility, costs, or performance benefits of new mechatronic equipment.<br>15) Assist in designing or developing automated control systems for environmental applications, such as waste processing, air quality, or water quality systems.<br>16) Assist in monitoring or calibrating automated systems, industrial control systems, or system components to maximize efficiency of production. |

| AREA | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRONIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHANICAL)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 3 | **Electronic Maintenance Supervisor**<br>1) Supervise assembling electronic components, subassemblies, products, or systems<br>2) Supervise positioning and aligning parts in specified relationship to each other in jig, fixture, or other holding device<br>3) Supervise crimps, stakes, screws, bolts, rivets, welds, solders, cements, press fits, or performs similar operations to join or secure parts in place, using hand tools, power tools, machines, and equipment<br>4) Supervise mounting assembled components, such as transformers, resistors, transistors, capacitors, integrated circuits, and sockets, on chassis panel<br>5) Supervise connecting component lead wires to printed circuit or routes and connects wires between individual component leads and other components, connectors, terminals, and contact points, using soldering, welding, thermos compression, or related bonding procedures and equipment<br>6) Supervise installing finished assemblies or subassemblies in cases and cabinets<br>7) Supervise assembling and attaches hardware, such as caps, clamps, knobs, and switches, to assemblies<br>8) Supervise performing intermediate assembly tasks, such as potting, encapsulating, sanding, cleaning, epoxy bonding, curing, stamping, etching, impregnating, and colour coding parts and assemblies<br>9) Supervise tends machines that press, shape, | **Mechanical Maintenance Supervisor**<br>1) Read, interpret and follow basic blueprints, diagrams, engineering drawings, specifications, bills of materials, and other written instructions or procedures to accurately assemble equipment and products<br>2) Utilise hand held tools such as a hand-held screw and drill gun<br>3) Supervise performing soldering, which is the process in which two or more metal items are joined together by melting and flowing a filler metal (solder) into the joint<br>4) Monitor inventory of product in work stations<br>5) Monitor quality work checks to insure the product meets quality standards<br>6) Check and verify product defects and complete appropriate documentation when defects are identified<br>7) Supervise rework and/or repair assembled equipment and products according to engineering specification changes<br>8) Perform all work in accordance with quality standards and established safety procedures<br>9) Monitor a clean and safe work area | **Mechatronic Maintenance Supervisor**<br>1) Check trouble areas<br>2) Supervise and monitor corrective action<br>3) Check and monitor equipment improvements to increase operational efficiency<br>4) Maintains appropriate level of technical and professional skills by attending training classes, seminars, exhibits, and trade shows as needed<br>5) Supervise adjustment and/or installs special functional parts of machines, devices and control instruments<br>6) Supervise repairing or replacing defective automation and machinery parts<br>7) Supervise assembling individual components through to complete systems or special machines in accordance with drawings |

| AREA | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRONIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHANICAL)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| | or wind component parts<br>10) Supervise adjusting or trimming materials from components to achieve specified electrical or dimensional characteristics<br>11) Supervise performing on-line go-not-go testing and inspection, using magnifying devices, measuring instruments, and electronic test equipment, to ensure parts and assemblies meet production specifications and standards<br>12) Supervise performing assembly operations under microscope or other magnifying device<br>13) Occupations related to assembly of printed circuit boards and fabrication of integrated circuit chips are defined under separate definitions | | |
| Level 2 | **Electronic Maintenance Technician**<br>1) Assemble electronic components, subassemblies, products, or systems<br>2) Positions and aligns parts in specified relationship to each other in jig, fixture, or other holding device<br>3) Crimps, stakes, screws, bolts, rivets, welds, solders, cements, press fits, or performs similar operations to join or secure parts in place, using hand tools, power tools, machines, and equipment<br>4) Mounts assembled components, such as transformers, resistors, transistors, capacitors, integrated circuits, and sockets, on chassis panel<br>5) Connects component lead wires to printed | **Mechanical Technician**<br>1) Read, interpret and follow basic blueprints, diagrams, engineering drawings, specifications, bills of materials, and other written instructions or procedures to accurately assemble equipment and products<br>2) Utilise hand held tools such as a hand-held screw and drill gun<br>3) Performing soldering, which is the process in which two or more metal items are joined together by melting and flowing a filler metal (solder) into the joint<br>4) Maintain inventory of product in work stations<br>5) Perform quality work checks to insure the product meets quality standards<br>6) Identify product defects and complete | **Mechatronic Maintenance Technician**<br>1) Identify trouble areas<br>2) Determine corrective action<br>3) Suggest and implements equipment improvements to increase operational efficiency<br>4) Maintains appropriate level of technical and professional skills by attending training classes, seminars, exhibits, and trade shows as needed<br>5) Adjust and/or installs special functional parts of machines, devices and control instruments<br>6) Repairs or replaces defective automation and machinery parts<br>7) Assembling individual components through to complete systems or special machines in |

| AREA | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRONIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHANICAL)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| | circuit or routes and connects wires between individual component leads and other components, connectors, terminals, and contact points, using soldering, welding, thermos compression, or related bonding procedures and equipment<br>6) Installs finished assemblies or subassemblies in cases and cabinets<br>7) Assembles and attaches hardware, such as caps, clamps, knobs, and switches, to assemblies<br>8) Performs intermediate assembly tasks, such as potting, encapsulating, sanding, cleaning, epoxy bonding, curing, stamping, etching, impregnating, and colour coding parts and assemblies<br>9) Tends machines that press, shape, or wind component parts<br>10) Adjusts or trims materials from components to achieve specified electrical or dimensional characteristics<br>11) Performs on-line go-not-go testing and inspection, using magnifying devices, measuring instruments, and electronic test equipment, to ensure parts and assemblies meet production specifications and standards<br>12) May perform assembly operations under microscope or other magnifying device<br>13) Occupations related to assembly of printed circuit boards and fabrication of integrated circuit chips are defined under separate definitions. | appropriate documentation when defects are identified<br>7) Rework and/or repair assembled equipment and products according to engineering specification changes<br>8) Perform all work in accordance with quality standards and established safety procedures<br>9) Maintain a clean and safe work area | accordance with drawings |

| AREA | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRONIC)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHANICAL)**<br>Responsibilities May Includes | **INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHATRONIC)**<br>Responsibilities May Includes |
|---|---|---|---|
| Level 1 | N/A | N/A | N/A |

## 4.5 MAPPING OS vs AVAILABLE NOSS

Table 4.7: OS vs Existing NOSS (1 of 10)

| SECTION | (C) MANUFACTURING | | | | | |
|---|---|---|---|---|---|---|
| DIVISION | (33) REPAIR OF MACHINERY AND EQUIPMENT | | | | | |
| GROUP | (331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT | | | | | |
| AREA | REPAIR OF FABRICATED METAL PRODUCTS (HYDRAULIC) | REPAIR OF FABRICATED METAL PRODUCTS (PNEUMATIC) | REPAIR OF FABRICATED METAL PRODUCTS (ELECTRICAL) | REPAIR OF FABRICATED METAL PRODUCTS (ELECTRONIC) | REPAIR OF FABRICATED METAL PRODUCTS (MECHANICAL) | REPAIR OF FABRICATED METAL PRODUCTS (MECHATRONIC) |
| LEVEL 8 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 7 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 6 | Hydraulic System Specialist | Pneumatic System Specialist | Electrical System Specialist | Electronic System Specialist | Mechanical System Specialist | Mechatronic System Specialist |
| LEVEL 5 | Hydraulic Maintenance Engineer | Pneumatic Maintenance Engineer | Electrical Maintenance Engineer | Electronic Maintenance Engineer | Mechanical Maintenance Engineer | Mechatronic Maintenance Engineer |
| LEVEL 4 | Hydraulic Maintenance Assistant Engineer | Pneumatic Maintenance Assistant Engineer | Electrical Maintenance Assistant Engineer | Electronic Maintenance Assistant Engineer | Mechanical Maintenance Assistant Engineer | Mechatronic Maintenance Assistant Engineer |
| LEVEL 3 | Hydraulic Maintenance Supervisor | Pneumatic Maintenance Supervisor | Electrical Maintenance Supervisor | Electronic Maintenance Supervisor | Mechanical Maintenance Supervisor | Mechatronic Maintenance Supervisor |
| LEVEL 2 | Hydraulic Maintenance Technician | Pneumatic Maintenance Technician | Electrical Maintenance Technician | Electronic Maintenance Technician | Mechanical Maintenance Technician | Mechatronic Maintenance Technician |
| LEVEL 1 | No Level | No Level | No Level | No Level | No Level | No Level |

Table 4.7a: OS vs Existing NOSS (2 of 10)

| SECTION | (C) MANUFACTURING | | | |
|---|---|---|---|---|
| DIVISION | (33) REPAIR OF MACHINERY AND EQUIPMENT | | | |
| GROUP | (331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT | | | |
| AREA | REPAIR OF MACHINERY (ROTARY ENGINE) | REPAIR OF MACHINERY (STEAM ENGINE) | REPAIR OF MACHINERY (ROTARY VANE ENGINE) | REPAIR OF MACHINERY (GAS ENGINE) |
| LEVEL 8 | Not Available | Not Available | Not Available | Not Available |
| LEVEL 7 | Not Available | Not Available | Not Available | Not Available |
| LEVEL 6 | Rotary Engine Maintenance Specialist | Steam Engine Maintenance Specialist | Rotary Vane Engine Maintenance Specialist | Gas Engine Maintenance Specialist |
| LEVEL 5 | Rotary Engine Maintenance Engineer | Steam Engine Maintenance Engineer | Rotary Vane Engine Maintenance Engineer | Gas Engine Maintenance Engineer |
| LEVEL 4 | Rotary Engine Maintenance Assistant Engineer | Steam Engine Maintenance Assistant Engineer | Rotary Vane Engine Maintenance Assistant Engineer | Gas Engine Maintenance Assistant Engineer |
| LEVEL 3 | Rotary Engine Maintenance Supervisor | Steam Engine Maintenance Supervisor | Rotary Vane Engine Maintenance Supervisor | Gas Engine Maintenance Supervisor |
| LEVEL 2 | Rotary Engine Maintenance Technician | Steam Engine Maintenance Technician | Rotary Vane Engine Maintenance Technician | Gas Engine Maintenance Technician |
| LEVEL 1 | No Level | No Level | No Level | No Level |

Table 4.7b: OS vs Existing NOSS (3 of 10)

| SECTION | (C) MANUFACTURING | | | | | |
|---|---|---|---|---|---|---|
| DIVISION | (33) REPAIR OF MACHINERY AND EQUIPMENT | | | | | |
| GROUP | (331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT | | | | | |
| AREA | REPAIR OF (HEATING, VENTILATION, AIR CONDITIONING - HVAC) | REPAIR OF (AIR-CONDITIONING AND MECHANICAL VENTILATION -ACMV) | REPAIR OF MACHINERY (PLANTS & MILLS) | REPAIR OF MACHINERY (WATER TREATMENT) | REPAIR OF MACHINERY (WEAPON TECHNOLOGY & MANAGEMENT) | REPAIR OF MACHINERY (AMMUNITION & EXPLOSIVE MANAGEMENT) |
| LEVEL 8 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 7 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 6 | Not Available | Not Available | Plants & Mills Machinery Maintenance Specialist | Water Treatment Machinery Maintenance Specialist | Not Available | Not Available |
| LEVEL 5 | ME-020-5:2012 HVAC Installation & Maintenance Operation Management | ACMV Installation & Maintenance Operation Engineer | Plants & Mills Machinery Maintenance Engineer | Water Treatment Machinery Maintenance Engineer | Senior Armament Officer | Ammo & Explosive Senior Executive |
| LEVEL 4 | ME-020-4:2012 HVAC Installation & Maintenance Operation Implementation and Administration | ACMV Installation & Maintenance Operation Assistant Engineer | Plants & Mills Machinery Maintenance Assistant Engineer | Water Treatment Machinery Maintenance Assistant Engineer | Armament Officer | Ammo & Explosive Executive |
| LEVEL 3 | ME-020-3:2012 HVAC Installation & Maintenance Operation Supervision | F432-003-3:2017 ACMV Installation & Maintenance Operation Supervision | C331-002-3:2017 Palm Oil Milling Mechanical Maintenance | C331-003-3:2017 Water Treatment Facility Supervision | DS-011-3 Senior Armourer | Ammo & Explosive Supervisor |
| LEVEL 2 | ME-020-2:2012 HVAC Installation & Maintenance Operation | F432-003-2:2017 ACMV Installation & Maintenance Operation | C331-002-2:2017 Palm Oil Milling Mechanical Maintenance | C331-003-2:2017 Water Treatment Facility Maintenance | DS-011-2 Armourer | Ammo & Explosive Technician |
| LEVEL 1 | No Level | No Level | No Level | No Level | No Level | No Level |

Table 4.7c: OS vs Existing NOSS (4 of 10)

| SECTION | (C) MANUFACTURING | | | |
|---|---|---|---|---|
| DIVISION | (33) REPAIR OF MACHINERY AND EQUIPMENT | | | |
| GROUP | (331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT | | | |
| AREA | REPAIR OF ELECTRONIC AND OPTICAL EQUIPMENT (ELECTRONIC AND OPTICAL EQUIPMENT) | REPAIR AND MAINTENANCE OF THE MEASURING, TESTING, NAVIGATING AND CONTROL EQUIPMENT (AIRCRAFT ENGINE INSTRUMENTS) | REPAIR AND MAINTENANCE OF THE MEASURING, TESTING, NAVIGATING AND CONTROL EQUIPMENT (AUTOMOTIVE EMISSIONS TESTING EQUIPMENT) | REPAIR AND MAINTENANCE OF THE MEASURING, TESTING, NAVIGATING AND CONTROL EQUIPMENT |
| LEVEL 8 | Not Available | Not Available | Not Available | Not Available |
| LEVEL 7 | Not Available | Not Available | Not Available | Not Available |
| LEVEL 6 | Not Available | Not Available | Not Available | Not Available |
| LEVEL 5 | Not Available | Aircraft Instrumentation and Control Engineer | Automotive Instrumentation Measurement Engineer | Instrumentation and Control Engineer |
| LEVEL 4 | Not Available | Aircraft Instrumentation and Control Assistant Engineer | Automotive Instrumentation Measurement Assistant Engineer | Instrumentation and Control Assistant Engineer |
| LEVEL 3 | Camera & Photographic Equipment Repairer | Aircraft Instrumentation and Control Supervisor | Automotive Instrumentation Measurement Supervisor | Instrumentation and Control Supervisor |
| LEVEL 2 | No Level | Aircraft Instrumentation and Control Technician | Automotive Instrumentation Measurement Technician | Instrumentation and Control Technician |
| LEVEL 1 | No Level | No Level | No Level | No Level |

Table 4.7d: OS vs Existing NOSS (5 of 10)

| SECTION | (C) MANUFACTURING | | | | |
|---|---|---|---|---|---|
| DIVISION | (33) REPAIR OF MACHINERY AND EQUIPMENT | | | | |
| GROUP | (331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT | | | | |
| AREA | REPAIR AND MAINTENANCE OF WATCHES | REPAIR AND MAINTENANCE OF TIME CLOCKS | REPAIR AND MAINTENANCE OF IRRADIATION, ELECTRO MEDICAL AND ELECTROTHERAPEUTIC EQUIPMENT | REPAIR AND MAINTENANCE OF IRRADIATION, ELECTRO MEDICAL AND ELECTROTHERAPEUTIC EQUIPMENT (PACEMAKERS) | REPAIR AND MAINTENANCE OF IRRADIATION, ELECTRO MEDICAL AND ELECTROTHERAPEUTIC EQUIPMENT (HEARING AIDS) |
| LEVEL 8 | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 7 | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 6 | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 5 | Not Available | Not Available | Biomedical Equipment Maintenance Engineer | Pacemaker Technician | Hearing Aid Specialist |
| LEVEL 4 | Not Available | Not Available | Biomedical Equipment Maintenance Assistant Engineer | No Level | Hearing Aid Assistant Specialist |
| LEVEL 3 | MC-011-3 Watch Maker | Clocksmith | Biomedical Equipment Maintenance Supervisor | No Level | Hearing Aid Technician |
| LEVEL 2 | MC-011-2 Watch Technician | No Level | Biomedical Equipment Maintenance Technician | No Level | No Level |
| LEVEL 1 | No Level | No Level | No Level | No Level | No Level |

Table 4.7e: OS vs Existing NOSS (6 of 10)

| SECTION | (C) MANUFACTURING | | |
|---|---|---|---|
| DIVISION | (33) REPAIR OF MACHINERY AND EQUIPMENT | | |
| GROUP | (331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT | | |
| AREA | REPAIR OF OPTICAL INSTRUMENTS AND PHOTOGRAPHIC EQUIPMENT (BINOCULARS, MICROSCOPES (EXCEPT ELECTRON, PROTON), TELESCOPES, PRISMS AND LENSES (EXCEPT OPHTHALMIC)) | REPAIR OF OPTICAL INSTRUMENTS AND PHOTOGRAPHIC EQUIPMENT (PHOTOGRAPHIC EQUIPMENT (IF THE USE MAINLY COMMERCIAL)) | REPAIR OF ELECTRICAL EQUIPMENT |
| LEVEL 8 | Not Available | Not Available | Not Available |
| LEVEL 7 | Not Available | Not Available | Not Available |
| LEVEL 6 | Not Available | Not Available | Not Available |
| LEVEL 5 | Not Available | Not Available | Mechanical & Electrical Engineer |
| LEVEL 4 | Not Available | Not Available | Mechanical & Electrical Assistant Engineer |
| LEVEL 3 | Microscope Service Technician | Camera & Photographic Equipment Repairer | Mechanical & Electrical Engineer |
| LEVEL 2 | No Level | No Level | Mechanical & Electrical Engineer |
| LEVEL 1 | No Level | No Level | No Level |

Table 4.7f: OS vs Existing NOSS (7 of 10)

| SECTION | (C) MANUFACTURING | | | | | |
|---|---|---|---|---|---|---|
| DIVISION | (33) REPAIR OF MACHINERY AND EQUIPMENT | | | | | |
| GROUP | (331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT | | | | | |
| AREA | REPAIR OF MACHINERY (AGRICULTURAL) | REPAIR OF TRANSPORT EQUIPMENT (SHIP HULL) | REPAIR OF TRANSPORT EQUIPMENT (SHIP MECHANICAL & PIPING SYSTEM) | REPAIR OF TRANSPORT EQUIPMENT (SHIP ELECTRONIC SYSTEM) | REPAIR OF TRANSPORT EQUIPMENT (SHIP ELECTRICAL SYSTEM) | REPAIR OF TRANSPORT EQUIPMENT (SHIP ENGINE MAINTENANCE) |
| LEVEL 8 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 7 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 6 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 5 | Agricultural Machinery Maintenance Engineer | Ship Hull and Superstructure Construction & Maintenance Engineer | TP-021-5:2012 Marine Mechanical Operation &Maintenance Management | TP-023-5:2012 Marine Electronics Operation &Maintenance Management | TP-020-5:2012 Marine Electrical Operation & Maintenance Management | TP-090-5 Second Engineer Officer Of 3000kw or More on Near Coastal Trade Voyage |
| LEVEL 4 | Agricultural Machinery Maintenance Assistant Engineer | Ship Hull and Superstructure Construction & Maintenance Assistant Engineer | TP-021-4:2012 Marine Mechanical Operation & Maintenance Administration | TP-023-4:2012 Marine Electronics Operation, Maintenance & Administration | TP-020-4:2012 Marine Electrical Operation & Maintenance Administration | TP-090-4 Watch Keeping Engineer Of 750kw or More on Near Coastal Trade Voyage |
| LEVEL 3 | C331-004-3:2017 Agricultural Machinery and Equipment Maintenance & Repair | C331-001-3:2017 Fibreglass Boat Hull & Superstructure Maintenance Supervision | TP-021-3:2013 Marine Mechanical Maintenance | TP-023-3:2013 Ship Electronics Maintenance | TP-020-3:2013 Ship Electrical Maintenance | H501-002-3:2017 Marine Engine Maintenance Operation |
| LEVEL 2 | Embedded to Level 2 | C331-001-2:2017 Fibreglass Boat Hull & Superstructure Maintenance Operation | Embedded to Level 3 | Embedded to Level 3 | Embedded to Level 3 | H501-002-2:2017 Marine Engine Room Watchkeeping |
| LEVEL 1 | No Level | No Level | No Level | No Level | No Level | No Level |

Table 4.7g: OS vs Existing NOSS (8 of 10)

| SECTION | (C) MANUFACTURING | | | | | |
|---|---|---|---|---|---|---|
| DIVISION | (33) REPAIR OF MACHINERY AND EQUIPMENT | | | | | |
| GROUP | (331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT | | | | | |
| AREA | REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (LOCOMOTIVES AND RAILROAD CARS (EXCEPT FACTORY REBUILDING OR FACTORY CONVERSION)) | REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AIRCRAFT MECHNICAL) | REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AVIONICS ELECTRICAL) | REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AVIONICS INSTRUMENTATION) | REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (STRUCTURE REPAIR) | REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AVIATION WELDING) |
| LEVEL 8 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 7 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 6 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 5 | H491-002-5:2017 Rolling Stock Maintenance Management | TP-060-5:2013 Aircraft Maintenance Operation And Certification | TP-071-5 Aircraft Maintenance Engineer Avionics (Electrical) | TP-072-5 Aircraft Maintenance Engineer Avionics (Instrument) | Not Available | Not Available |
| LEVEL 4 | H491-002-4:2017 Rolling Stock Maintenance Planning and Controlling | TP-060-4:2013 Aircraft Maintenance Operation And Certification (Limited Maintenance Authorization) | TP-070-4 Aircraft Maintenance Technician (Avionics) | | Not Available | Not Available |
| LEVEL 3 | H491-002-3:2017 Rolling Stock Maintenance Quality Control | TP-060-3:2013 Aircraft Maintenance Operation (Non-Certifying) | | | TP-076-3:2012 Aircraft Structure Repair-Composite TP-073-3:2012 Aircraft Structure Repair-Sheet Metal | TP-074-3:2012 Aviation Welding |
| LEVEL 2 | H491-002-2:2017 Rolling Stock Maintenance | Embedded to Level 3 | Embedded to Level 3 | Embedded to Level 3 | Embedded to Level 3 | TP-074-2:2012 Aviation Welding |
| LEVEL 1 | No Level | No Level | No Level | No Level | No Level | TP-074-1:2012 Aviation Welding |

Table 4.7h: OS vs Existing NOSS (9 of 10)

| SECTION | (C) MANUFACTURING | | | |
|---|---|---|---|---|
| DIVISION | (33) REPAIR OF MACHINERY AND EQUIPMENT | | | |
| GROUP | (331) REPAIR OF FABRICATED METAL PRODUCTS, MACHINERY AND EQUIPMENT | | | |
| AREA | REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AIRCRAFT ENGINES - TURBINE) | REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AIRCRAFT ENGINES - ROTOCRAFT) | REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (ANIMAL DRAWN BUGGIES AND WAGONS) | REPAIR OF OTHER EQUIPMENT (ORGANS AND OTHER HISTORICAL MUSICAL INSTRUMENTS) |
| LEVEL 8 | Not Available | Not Available | Not Available | Not Available |
| LEVEL 7 | Not Available | Not Available | Not Available | Not Available |
| LEVEL 6 | Not Available | Not Available | Not Available | Not Available |
| LEVEL 5 | Turbine Aircraft Engine Maintenance Engineer | Rotocraft Aircraft Engine Maintenance Engineer | No Level | No Level |
| LEVEL 4 | Turbine Aircraft Engine Maintenance Assistant Engineer | Rotocraft Aircraft Engine Maintenance Assistant Engineer | No Level | No Level |
| LEVEL 3 | Turbine Aircraft Engine Maintenance Supervisor | Rotocraft Engine Maintenance Supervisor | Animal Drawn Buggies and Wagons Supervisor | Musical Instrument Maintenance Supervisor |
| LEVEL 2 | Turbine Aircraft Engine Maintenance Technician | Rotocraft Engine Maintenance Technician | Animal Drawn Buggies and Wagons Technician | Musical Instrument Maintenance Technician |
| LEVEL 1 | No Level | No Level | No Level | No Level |

Table 4.7i: OS vs Existing NOSS (10 of 10)

| SECTION | (C) MANUFACTURING | | | | | |
|---|---|---|---|---|---|---|
| DIVISION | (33) REPAIR OF MACHINERY AND EQUIPMENT | | | | | |
| GROUP | (332) INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT | | | | | |
| AREA | INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (HYDRAULIC) | INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (PNEUMATIC) | INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRICAL) | INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRONIC) | INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHANICAL) | INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHATRONIC) |
| LEVEL 8 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 7 | Not Available | Not Available | Not Available | Not Available | Not Available | Not Available |
| LEVEL 6 | Hydraulic System Specialist | Pneumatic System Specialist | Electrical System Specialist | Electronic System Specialist | Mechanical System Specialist | Mechatronic System Specialist |
| LEVEL 5 | Hydraulic Maintenance Engineer | Pneumatic Maintenance Engineer | Electrical Maintenance Engineer | Electronic Maintenance Engineer | Mechanical Maintenance Engineer | Mechatronic Maintenance Engineer |
| LEVEL 4 | Hydraulic Maintenance Assistant Engineer | Pneumatic Maintenance Assistant Engineer | Electrical Maintenance Assistant Engineer | Electronic Maintenance Assistant Engineer | Mechanical Maintenance Assistant Engineer | Mechatronic Maintenance Assistant Engineer |
| LEVEL 3 | Hydraulic Maintenance Supervisor | Pneumatic Maintenance Supervisor | Electrical Maintenance Supervisor | Electronic Maintenance Supervisor | Mechanical Maintenance Supervisor | Mechatronic Maintenance Supervisor |
| LEVEL 2 | Hydraulic Maintenance Technician | Pneumatic Maintenance Technician | Electrical Maintenance Technician | Electronic Maintenance Technician | Mechanical Maintenance Technician | Mechatronic Maintenance Technician |
| LEVEL 1 | No Level | No Level | No Level | No Level | No Level | No Level |

## 4.6 Occupational Description (OD)

Occupational of Job Description is a broad, general, and written statement of a specific job, based on the findings of a job analysis. It generally includes duties, purpose, responsibilities, scope, and working conditions of a job along with the job's title, and the name or designation of the person to whom the employee reports. The Occupational Description provided in Annex 4 are the job titles that have been identified as critical or hard-to-fill job as suggested by Critical Skills Monitoring Committee (CSC) and industry representatives from focus group.

## 4.7 Skills in Demand

The respondents have explicitly marked the top 5 skills highly demanded by the employer are troubleshooting / problem solving, diagnostic, product knowledge, strong technical aptitude and general attitude towards work.

i. Jobs in Demand

The skilled and semi-skilled workers for both groups (331 & 332) are highly in demand as the current manpower supply in short of these two groups of workers. Elementary / low skilled workers are low in demand as there is surplus of foreign workers to fill up the low skilled workers segmentation.

ii. Skills Gaps

The respondents ranked major changes in traditional training and new skill requirements as the main reason for skills gap and the attitude as the second main contributing factor. Majority of the respondents suggested that skills training curriculum must be revised and suits the current requirements of the industry.

iii. Emerging Skills

The M&E industry represents one of the most innovative sectors in the economy which combines all of the key future technologies including electronics, robotics, materials and software integration and thus a key player in the next industrial revolution - Industry 4.0. The total number of job area identified is 51 with 200 job titles. A total of 26 job titles identified as

relevant to Industry 4.0. In order to survive in the era of IR4.0, the respondents unanimously ranked personal skills and technical know-how as the most important required skills for IR4.0. From the context of IR4.0, personal skills refer to adaptability & ability to change, decision making, working in team, communication skills, and mindset change for lifelong learning.

## 4.8 Chapter Conclusion

Based on the discussions with panel members during the development workshops and survey findings, the OS of the industry is produced in this chapter. The OS would provide information of the competency or job areas applicable to the industry, and the skill level of the different job titles, according to the MOSQF Level Descriptors, and the available career paths.

The jobs and skills in demand, and the specific steps proposed to be taken by various parties to bridge the skills gaps are elaborated so that the parties concerned could take the necessary steps to overcome such challenges.

# CHAPTER 5:
# DISCUSSION, RECOMMENDATION AND CONCLUSION

## 5.1 Discussion

Based on the findings obtained throughout the Occupational Analysis on the industry, a total 51 job areas have been identified with 45 job areas belong to group 331 dan the remaining is for group 332. From this 51 job areas, a total 200 job titles have been identified, these job titles identified require a holistic view in development of standard, skills training and also certification for recognition. If the competency requirements documented in NOSS format, the personnel in these areas will obtain a more structured skills training and will also enable personnel who are experienced and skilled to be certified. The list of NOSS developed under the Division 33 is presented in Table 2.6.

## 5.2 Recommendation

It is hoped that the result of this Occupational Framework will be used as reference to fulfil the future plans of developing skilled personnel and certifying Malaysians in this sector towards improving the quality of the local sector and thus spurring Malaysia's global competitiveness.

There are several options when addressing or mitigating workforce demand and supply. It may include establishing and maintaining partnerships with other agencies or departments, or educational institutions to increase external talent pools and also through the training of existing staff in line with new skills requirements.

Based on the above comments, specific recommendations are listed below:

i) To continue and streamline efforts in NOSS development for areas under the sector in line with the findings of this analysis. This includes the development of the NOSS for the sectors and sub-sectors that are in demand and have not been developed.

ii) To encourage apprenticeship training (National Dual Training System – NDTS) for the related job area.

iii) Promote certification of existing and experienced personnel in the sector through Recognition of Prior Achievements *(Pengiktirafan Pencapaian Terdahulu – PPT)*.

## 5.3 Conclusion

The conclusion is based on the specified objectives of the Occupational Framework as elaborated below:

**Objective 1: Occupational Structure**

As a result of the Repair and Installation of Machinery & Equipment Sector Occupational Framework conducted together with expert panel members from various organizations, a total of 15 sub-sectors and 186 job titles have been identified.

By planning and conducting the training and certification of this sector personnel in the near future, it is hoped that there will be a steady flow of local skilled and certified workers.

**Objective 2: Occupational Descriptions**

The Occupational Descriptions for all the different job titles were obtained during the workshops and further confirmed during the survey. These Occupational Descriptions will also serve as reference of job scope and the required competencies for NOSS development.

**Objective 3: Skills in Demand**

Based on the survey findings, the survey respondents highlighted the skills in demand are as follows:

- Communication skills
- Product knowledge
- Customer service skills
- General attitude towards work (commitment, resourcefulness, teamwork, etc.)
- Diagnostic skills

- Troubleshooting / problem solving skills
- Strong technical aptitude / manual dexterity
- Competent in using computerized / other mechanical devices
- English language competency

Troubleshooting / problem solving skills, Strong technical aptitude / manual dexterity, and Product knowledge are the top 3 skills in high demand by the industry. The skills above are encouraged to be included in the training curriculum according to the respective areas.

**Critical Job Titles**

The Government of Malaysia established the Critical Skills Monitoring Committee (CSC) as part of the Eleventh Malaysian Plan with the mandate to monitor skills imbalances. One of the CSC's primary objectives is to develop a Critical Occupations List (COL) to serve as a platform for the coordination of human capital development policies. The CSC is jointly chaired by Talent Corporation (TalentCorp) and the Institute for Labour Market Information and Analysis (ILMIA), which is an agency in the Ministry of Human Resources (MOHR). This institutional structure allows the CSC to draw on ILMIA's labour market information sources, including its Labour Market Information Data Warehouse, and on TalentCorp's ties with stakeholders in the private sector. The Critical Skills Monitoring Committee (CSC) publishes an annual Critical Occupations List (COL). The COL is a list of occupations for which there is strong evidence that there is significant labour market shortage that may be alleviated through government action. Occupations on the COL meet the criteria of being skilled, sought-after, and strategic. The COL seeks to identify and draw stakeholder attention to this set of occupations that are critical to the continued growth and development of the Malaysian economy but that are currently difficult to fill.[19]

The respondents and Focus Group Discussion members have reviewed the list and specified the critical job titles as in the table on the next page.

[19] Critical Skills Monitoring Committee (CSC). 2018. Critical Occupations List 2017/2018 Technical Report. CSC.

Table 4.8: List of Critical Job Titles

| No. | Critical Job Title | Group/Area | Level |
|---|---|---|---|
| 1 | Electrical Maintenance Technician | 331/Electrical | 2 |
| 2 | Electrical Maintenance Supervisor | 331/Electrical | 3 |
| 3 | Electrical Maintenance Assistant Engineer | 331/Electrical | 4 |
| 4 | Electrical Maintenance Engineer | 331/Electrical | 5 |
| 5 | Electronic Maintenance Technician | 331/Electronic | 2 |
| 6 | Electronic Maintenance Supervisor | 331/Electronic | 3 |
| 7 | Electronic Maintenance Assistant Engineer | 331/Electronic | 4 |
| 8 | Electronic Maintenance Engineer | 331/Electronic | 5 |
| 9 | Mechanical Maintenance Technician | 331/ Mechanical | 2 |
| 10 | Mechanical Maintenance Supervisor | 331/ Mechanical | 3 |
| 11 | Mechanical Maintenance Assistant Engineer | 331/ Mechanical | 4 |
| 12 | Mechanical Maintenance Engineer | 331/ Mechanical | 5 |
| 13 | Armourer | 331/ Weapon | 2 |
| 14 | Senior Armourer | 331/ Weapon | 3 |
| 15 | Armament Officer | 331/ Weapon | 4 |
| 16 | Senior Armament Officer | 331/ Weapon | 5 |
| 17 | Ammo & Explosive Technician | 331/ Ammo & Explosive | 2 |
| 18 | Ammo & Explosive Supervisor | 331/ Ammo & Explosive | 3 |
| 19 | Ammo & Explosive Executive | 331/ Ammo & Explosive | 4 |
| 20 | Ammo & Explosive Senior Executive | 331/ Ammo & Explosive | 5 |
| 21 | Ship Electronic System Installation & Maintenance Fitter | 331/ Ship Electronic System | 2 |
| 22 | Ship Electronic System Installation & Maintenance Supervisor | 331/ Ship Electronic System | 3 |
| 23 | Ship Electronic System Installation & Maintenance Assistant Engineer | 331/ Ship Electronic System | 4 |
| 24 | Ship Electronic System Installation & Maintenance Engineer | 331/ Ship Electronic System | 5 |

| No. | Critical Job Title | Group/Area | Level |
|---|---|---|---|
| 25 | Ship Electrical System Installation & Maintenance Fitter | 331/ Ship Electrical System | 2 |
| 26 | Ship Electrical System Installation & Maintenance Supervisor | 331/ Ship Electrical System | 3 |
| 27 | Ship Electrical System Installation & Maintenance Assistant Engineer | 331/ Ship Electrical System | 4 |
| 28 | Ship Electrical System Installation & Maintenance Engineer | 331/ Ship Electrical System | 5 |
| 29 | Aviation Mechanical Technician | 331/ Aviation Mechanical | 2 |
| 30 | Aviation Mechanical Supervisor | 331/ Aviation Mechanical | 3 |
| 31 | Aviation Mechanical Assistant Engineer | 331/ Aviation Mechanical | 4 |
| 32 | Aviation Mechanical Engineer | 331/ Aviation Mechanical | 5 |
| 33 | Aircraft Engine Maintenance Technician | 331/ Aircraft Engine | 2 |
| 34 | Aircraft Engine Maintenance Supervisor | 331/ Aircraft Engine | 3 |
| 35 | Turbine Aircraft Engine Maintenance Assistant Engineer | 331/ Turbine Engine | 4 |
| 36 | Turbine Aircraft Engine Maintenance Engineer | 331/ Turbine Engine | 5 |
| 37 | Rotocraft Aircraft Engine Maintenance Assistant Engineer | 331/ Rotocraft Engine | 4 |
| 38 | Rotocraft Aircraft Engine Maintenance Engineer | 331/ Rotocraft Engine | 5 |
| 39 | Electrical Maintenance Technician | 332/ Electrical | 2 |
| 40 | Electrical Maintenance Supervisor | 332/ Electrical | 3 |
| 41 | Electrical Maintenance Assistant Engineer | 332/ Electrical | 4 |
| 42 | Electrical Maintenance Engineer | 332/ Electrical | 5 |
| 43 | Electronic Maintenance Technician | 332/ Electronic | 2 |
| 44 | Electronic Maintenance Supervisor | 332/ Electronic | 3 |
| 45 | Electronic Maintenance Assistant Engineer | 332/ Electronic | 4 |
| 46 | Electronic Maintenance Engineer | 332/ Electronic | 5 |
| 47 | Mechanical Maintenance Technician | 332/ Mechanical | 2 |
| 48 | Mechanical Maintenance Supervisor | 332/ Mechanical | 3 |
| 49 | Mechanical Maintenance Assistant Engineer | 332/ Mechanical | 4 |

| No. | Critical Job Title | Group/Area | Level |
|---|---|---|---|
| 50 | Mechanical Maintenance Engineer | 332/ Mechanical | 5 |

**Overall Conclusion**

Several essential steps need to be undertaken jointly by stakeholders from industry, training/academic institutions and the relevant accreditations authorities to ensure that the critical occupation needs of industry are addressed.

The broad direction for achieving this:

i) Identify and assess the qualifications, National Occupational Skills Standard (NOSS), and competencies associated with the identified critical job titles.

ii) Align and evaluate the existing training curriculum and training packages.

iii) Coordination among stakeholder to
- Revise or develop required curriculum and training packages
- Expand or create new apprenticeships/ internships / attachments schemes
- Joint technology and knowledge transfer between instructor / training entities with industry experts

The result of this Occupational Framework research and development work will be able to be used as a reference as how to fulfil the future plans of developing skilled personnel and certifying Malaysians in the Machinery & Equipment Sector towards enhancing services provided by the sector players.

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# ANNEX 1:
# MOSQF LEVEL DESCRIPTORS

**MALAYSIAN OCCUPATIONAL SKILLS QUALIFICATION FRAMEWORK (MOSQF)**
**LEVEL DESCRIPTOR**

| Level | Level Description |
|---|---|
| **8** | Achievement at this level reflects the ability to develop original understanding and extend a sub-area of knowledge or professional practice. It reflects the ability to address problematic situations that involve many complexes, interacting factors through initiating, designing and undertaking research, development or strategic activities. It involves the exercise of broad autonomy, judgement and leadership in sharing responsibility for the development of a field of work or knowledge, or for creating substantial professional or organisational change. It also reflects a critical understanding of relevant theoretical and methodological perspectives and how they affect the field of knowledge or work. |
| **7** | Achievement at this level reflects the ability to reformulate and use relevant understanding, methodologies and approaches to address problematic situations that involve many interacting factors. It includes taking responsibility for planning and developing courses of action that initiate or underpin substantial change or development, as well as exercising broad autonomy and judgment. It also reflects an understanding of theoretical and relevant methodological perspectives, and how they affect their sub-area of study or work. |
| **6** | Achievement at this level reflects the ability to refine and use relevant understanding, methods and skills to address complex problems that have limited definition. It includes taking responsibility for planning and developing courses of action that are able to underpin substantial change or development, as well as exercising broad autonomy and judgment. It also reflects an understanding of different perspectives, approaches of schools of thought and the theories that underpin them. |
| **5** | Achievement at this level reflects the ability to identify and use relevant understanding, methods and skills to address broadly-defined, complex problems. It includes taking responsibility for planning and developing courses of action as well as exercising autonomy and judgment within broad parameters. It also reflects understanding of different perspectives, approaches or schools of thought and the reasoning behind them. |
| **4** | Achievement at this level reflects the ability to identify and use relevant understanding, methods and skills to address problems that are well defined but complex and non-routine. It includes taking responsibility for overall courses of action as well as exercising autonomy and judgment within fairly broad parameters. It also reflects under-standing of different perspective or approaches within a sub-area of study or work. |
| **3** | Achievement at this level reflects the ability to identify and use relevant understanding, methods and skills to complete task and address problems that are well defined with a measure of complexity. It includes taking responsibility for initiating and completing tasks and procedures as well as exercising autonomy and judgments within limited parameter. It also reflects awareness of different perspectives or approaches within a sub-area of study or work. |
| **2** | Achievement at this level reflects the ability to select and use relevant knowledge, ideas, skills and procedures to complete well-defined tasks and address straightforward problem. It includes taking responsibility for |

| | |
|---|---|
| | completing tasks and procedures, and exercising autonomy and judgment subject to overall direction or guidance. |
| **1** | Achievement at this level reflects the ability to use relevant knowledge, skills and procedures to complete routine and predictable tasks that include responsibility for completing tasks and procedures subject to direction or guidance. |

# ANNEX 2:
# LIST OF CONTRIBUTORS

**LIST OF SECTOR PANEL MEMBERS FOR THE REPAIR AND INSTALLATION OF MACHINERY & EQUIPMENT SECTOR FRAMEWORK DEVELOPMENT**

| NO | NAME | EXPERTISE | POSITION | ORGANISATION |
|---|---|---|---|---|
| 1 | Chong Thim | Machinery | Managing Director | Numac Machinery Sdn. Bhd. |
| 2 | Datuk Mohamad Saleh Bin Ghazali | Plastic Machinery | Managing Director | Micromagna Machinery Sdn. Bhd. |
| 3 | Jaafar Bin Baidi | Operation of Machinery & Equipment Sector | Executive Secretary | Machinery and Equipment Manufacturers Association of Malaysia |
| 4 | Chan Chee Tatt | Human Resources & Technical Training | HR & Technical Training Manager | Favelle Favco Cranes (M) Sdn. Bhd. |
| 5 | Rosfariza Binti Mohd Amin | Human Resources | General Manager; Human Resources | Muhibbah Engineering Berhad |
| 6 | Gangga Sinaran Maqnikham | Learning & Development | Human Resources Manager | Muhibbah Engineering Berhad |
| 7 | Andy Ng | Air Compressor | Managing Director | Carling Air Compressor Sdn Bhd |
| 8 | Ir. A.K. Woo | Engineering Services | Managing Director | Master Jaya Engineering Sdn. Bhd. |
| 9 | Osman Bin Hj Isa | Industrial Analysis & Processing | Section Head Industrial Analysis & Processing | Department of Occupational Safety & Health (DOSH) Selangor |
| 10 | Mohd Syarafi Bin Rohseli | Engineering Services | Operation Manager | Ceteau Malaysia Sdn Bhd |
| 11 | Michael Maniyarasu Sanjeevi | Electrical Engineering | Managing Director | Gumi Asli Elektrikal Sdn Bhd |
| 12 | Richard C.F. Ng | Air Compressor | Operation Manager | Carling Air Compressor Sdn Bhd |

| NO | NAME | EXPERTISE | POSITION | ORGANISATION |
|---|---|---|---|---|
| 13 | Christopher Raja Selvan | Water Filtering System | Engineer | Puncak Enviro Sdn Bhd |
| 14 | Muhammad Fauzan Bin Mat Yusoff | Ship Building & Repair | Senior Engineer | Destini Shipbuilding & Engineering Sdn Bhd |
| 15 | Norazrey Bin Sulaiman | Engineering Services | Managing Director | NARM Resources Sdn Bhd |
| 16 | Andrew Yew Kwan Hoe | Hydraulic System | Managing Director | Juthye Hydraulic Solutions Sdn Bhd |

## LIST OF OCCUPATIONAL FRAMEWORK TECHNICAL EVALUATION COMMITTEE

| NO. | NAME | ORGANISATION |
|---|---|---|
| 1. | Noor Azlan Bin Adnan | President<br>SRS Industrial Welding & Fabrication Sdn Bhd |
| 2. | Aedreena Reeza Binti Alwi | Director<br>Sectoral Policy, Ministry of International Trade and Industry (MITI) |
| 3. | Nik Mohd Ikram Bin Nik Mohd Azami | Assistant Director<br>Machinery and Metals Division<br>Malaysian Investment Development Authority (MIDA) |
| 4. | Romiati Binti Chinkeruan | Assistant Director<br>Department of Statistics Malaysia |
| 5. | Dr. Balasubramaniam a/l A.Tarumaraja | Principal Assistant Director<br>Institute of Labour Market Information and Analysis (ILMIA) |
| 6. | Hamdan Bin Muhamad Isa | Assistant Director<br>Department of Statistics Malaysia |
| 7. | Thavamani a/p Krishnan | Principal Assistant Director<br>Ministry of International Trade and Industry (MITI) |

## LIST OF DEPARTMENTS OF SKILLS DEVELOPMENT (DSD) OFFICERS INVOLVED IN OCCUPATIONAL FRAMEWORK DEVELOPMENT

| NO. | NAME | ORGANISATION |
|---|---|---|
| 1. | Mohd. Yazid Bin Awalludin | Director<br>NOSS Division<br>Department of Skills Development |
| 2. | Siti Hasmah Binti Mustapha | Principal Assistant Director<br>Department of Skills Development |
| 3. | Noorita Binti Lateh | Senior Assistant Director<br>Department of Skills Development |
| 4. | Noor Azura Binti Adnan | Senior Assistant Director<br>Department of Skills Development |
| 5. | Ahmad Azran Bin Ranaai | Senior Assistant Director<br>Department of Skills Development |
| 6. | Jefrizain Bin Abdul Rasid | Assistant Director<br>Department of Skills Development |
| 7. | Ahmad Azran Bin Ranaai | Senior Assistant Director<br>Department of Skills Development |
| 8. | Zainal Bin Abd Jalil | Senior Assistant Skills Officer<br>Department of Skills Development |

## LIST OF RESEARCH TEAM AND SECRETARIAT

| NO. | NAME | POSITION/ ORGANISATION |
|---|---|---|
| 1 | Abu Musa Bin Mohamad Isa | Facilitator/ Researcher |
| 2 | Fahiszam Bin Saad | Co-Fasilitator |
| 3 | Dr. Azahari Bin Jamaluddin | Researcher, Precious Galaxy |
| 4 | Dr. Haliza Binti Mohd Said | Researcher, Precious Galaxy |

# ANNEX 3:
# QUESTIONNAIRE

# Repair and Installation of Machinery and Equipment Industry Occupational Framework Survey

The Department of Skills Development (DSD), Ministry of Human Resources is currently conducting an analysis on the Occupational Framework of the Industry. From this analysis, the industry framework, occupational structure, occupational job titles, and job description will be summarised for the use of the government, private sector, investors, employers, employees, educators or any personnel involved either directly or indirectly with the industry.

The main objective of this research is to enhance skills training starting from the entry level position for any job in this industry based on input from the industry. It will also provide a reference competency for skills required by workers to perform as required in the industry.

This survey will be used as field data in order to conduct a comprehensive analysis of the industry's Occupational Framework. The target group for this survey is the organisation's representative either from the Human Resource Department or personnel at Management level.

We would like to extend our heartfelt gratitude upon your cooperation in answering this survey. Please fill in where necessary in the forms provided. Do advise us if you wish to remain anonymous in your survey response. There will be further communication with survey respondents in order to verify our findings. The completed questionnaire can be emailed to:

**Abu Musa bin Mohamad Isa: abumusa.isa@gmail.com**

**Survey Respondent Details**

Name :

Position :

Organisation :

Date :

**Please answer the questions below in the space provided, additional pages may be added if necessary. There are 4 SECTIONS in this 8-PAGE survey.**

## SECTION 1: COMPETENCY IN DEMAND

2.1 Listed below are set of skills related to personnel involve in **repair and installation of machinery and equipment.** Rate the level of demand to the set of skills by using the scale below:

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **Not In Demand** | **Low In Demand** | **In Demand** | **High In Demand** |

| No. | Competency | Rating Score |
|---|---|---|
| **1** | Sales and upselling skills | |
| **2** | Communication skills | |
| **3** | Product knowledge | |
| **4** | Customer service skills | |
| **5** | General attitude towards work (commitment, resourcefulness, teamwork, etc.) | |
| **6** | Diagnostic skills | |
| **7** | Troubleshooting / problem solving skills | |
| **8** | Strong technical aptitude / manual dexterity | |
| **9** | Competent in using computerized / other mechanical devices | |
| **10** | English language competency | |

2.2 Based on your observation, do you think the graduates / trainee / apprentice / current workers possess the skills required by the industry? If 'No' please respond to the following questions (Question 1.3 & 1.4).

[__] Yes

[__] No

**2.3** What is/are the reason/s for the skills gap? Tick (√) where applicable, you may tick more than once.

[__] Education / training mismatch

[__] Major changes in traditional training and new skill requirements

[__] Attitude (e.g. lack of desire to work)

[__] other; please specify: ……

2.4 What is/are solution/s for the skills gap would you recommend? Tick (√) where applicable, you may tick more than once.

[__] Review employment policy (e.g. enhance skilled workers incentives)

[__] Training / retraining

[__] Review skills training curriculum

[__] Formal mentoring and/or coaching

[__] other; please specify: ……

## SECTION 2: JOBS IN DEMAND

**2.1** Listed below are job areas and description of category of skills. Based on your observation, which job area is experiencing **shortage of manpower in repair and installation of machinery and equipment industry**?

Tick (√) where applicable.

| Category of Skills | Description |
|---|---|
| **Skilled Workers** | Managers, Professionals, Technicians and Associate Professionals |
| **Semi-Skilled Workers** | Clerical Support, Service and Sales, Craft and related Trades Workers and Plant and Machine Operators and Assemblers |
| **Low Skilled Workers** | Elementary Workers |

| No. | Job Areas & Category of Skills | High Shortage | Mid Shortage | Low Shortage | No Shortage |
|---|---|---|---|---|---|
| 1 | **Repair of fabricated metal products, machinery and equipment** | | | | |
| | a) Skilled Workers | | | | |
| | b) Semi-Skilled Workers | | | | |
| | c) Low Skilled Workers | | | | |
| 2 | **Installation of industrial machinery and equipment** | | | | |
| | d) Skilled Workers | | | | |
| | e) Semi-Skilled Workers | | | | |
| | f) Low Skilled Workers | | | | |

## SECTION 3: EMERGING SKILLS

*(Note: Emerging Skills are skills that are predicted to be imperative to the industry in the near future based on recent development, trend or study)*

**3.1** Do you think Industry Revolution 4.0 (Digitalisation) (IR4.0) would give an impact to the economic activities of repair and installation of machinery and equipment?

[__] Yes

[__] No

[__] Not sure

**3.2** Listed below are the nine (9) technology drives/pillars of IR 4.0. Which job area is likely to be affected by these 9 technology drives/pillars of IR 4.0?

Tick (√) where applicable, you may tick more than once.

| NO. | TECHNOLOGY DRIVES / PILLARS | JOB AREAS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Repair of fabricated metal products | Repair of machinery | Repair of electronic and optical equipment | Repair of electrical equipment | Repair of transport equipment, except motor vehicles | Repair of other equipment | Installation of industrial machinery and equipment |
| 1 | **Autonomous Robots** (coordinated and automated actions of robots to complete tasks intelligently, with minimal human input) | | | | | | | |
| 2 | **Big Data Analytics** (the analysis of ever larger volumes of data. Circulation, collection, and analysis of | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | information is a necessity because it supports productivity growth based on a real-time decision-making process) | | | | | | | |
| **3** | **Cloud Computing** (storing and accessing data and programs over the Internet instead of your computer's hard drive) | | | | | | | |
| **4** | **Internet of Things (IoT)** (all machines and systems connected to the production plant (as well as other systems) must be able to collect, exchange and save these massive volumes of information, in a completely autonomous way and without the need of human intervention) | | | | | | | |
| **5** | **Additive Manufacturing (3D Printing)** (use in prototyping, design iteration and small scale production and often described as "rapid prototyping" - produce the desired components faster, more flexibly and more precisely than ever before) | | | | | | | |
| **6** | **System Integration** (the process of linking together | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | different computing systems and software applications physically or functionally to act as a coordinated whole via Internet of Things-IoT) | | | | | | | |
| **7** | **Cybersecurity** (with the increased connectivity and use of standard communications protocols, the need to protect critical industrial systems and manufacturing lines from cybersecurity threats is increasing) | | | | | | | |
| **8** | **Augmented Reality** (Augmented-reality-based systems support a variety of services, such as selecting parts in a warehouse and sending repair instructions over mobile devices - provide workers with real-time information to improve decision making and work procedures) | | | | | | | |
| **9** | **Simulation** (simulations will leverage real-time data to mirror the physical world in a virtual model, which can include machines, products, and humans. This allows operators to test and optimize the machine settings for the next product in line in the virtual world before the physical changeover, thereby driving down machine setup times and increasing quality) | | | | | | | |

**3.3** Table 2 is the list of important prerequisite and skills required in order to equip the workforce for IR 4.0. Select prerequisite and skills that are relevant to the job area. Tick (√) where applicable, you may tick more than once.

**Table 2:** The description of important prerequisite and skills for workforce in the age of IR4.0 published in Skill Development for Industry 4.0 Whitepaper by Roland Berger GMBH in 2016

| PREREQUISITE & SKILLS | KNOWLEDGE ABOUT ICT | ABILITY TO WORK WITH DATA | TECHNICAL KNOW-HOW | PERSONAL SKILLS |
|---|---|---|---|---|
| **DETAILS** | ▪ Basic Information Technology knowledge<br>▪ Ability to use and interact with computers and smart machines like robots, tablets etc.<br>▪ Understanding machine to machine communication, IT security & data protection | ▪ Ability to process and analyze data and information obtained from machines<br>▪ Understanding visual data output & making decisions<br>▪ Basic statistical knowledge | ▪ Inter-disciplinary & generic knowledge about technology<br>▪ Specialized knowledge about manufacturing activities and processes in place<br>▪ Technical know-how of machines to carry out maintenance related activities | ▪ Adaptability & ability to change<br>▪ Decision making<br>▪ Working in team<br>▪ Communication skills<br>▪ Mindset change for lifelong learning |

| No. | Job Areas | IMPORTANT PREREQUISITE AND SKILLS FOR IR4.0 | | | |
|---|---|---|---|---|---|
| | | KNOWLEDGE ABOUT ICT | ABILITY TO WORK WITH DATA | TECHNICAL KNOW-HOW | PERSONAL SKILLS |
| **1** | Repair of fabricated metal products | | | | |
| **2** | Repair of fabricated metal products | | | | |
| **3** | Repair of fabricated metal products | | | | |
| **4** | Repair of fabricated metal products | | | | |
| **5** | Repair of fabricated metal products | | | | |
| **6** | Repair of fabricated metal products | | | | |
| **7** | Installation machinery and equipment of industrial | | | | |

## SECTION 4: RELATED ISSUES

**4.1** What is/are the key issue/s related to repair and installation of machinery and equipment industry?

Please rate **ALL** the key issues by using the scale below.

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **Strongly Disagree** | **Disagree** | **Agree** | **Strongly Agree** |

| NO. | KEY ISSUES | JOB AREAS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Repair of fabricated metal products | Repair of machinery | Repair of electronic and optical equipment | Repair of electrical equipment | Repair of transport equipment, except motor vehicles | Repair of other equipment | Installation of industrial machinery and equipment |
| **1** | Insufficient manpower | | | | | | | |
| **2** | Low skilled and low performance workforce | | | | | | | |
| **3** | High dependency on foreign labour | | | | | | | |
| **4** | Underpayment of wages lead to high turn over | | | | | | | |
| **5** | Quality inconsistency (product & services) | | | | | | | |
| **6** | Maintaining profitability | | | | | | | |
| **7** | Economic conditions | | | | | | | |
| **8** | Government policy/regulation | | | | | | | |
| **9** | Labour costs (wages) | | | | | | | |
| **10** | Labour costs (sub-contractors) | | | | | | | |
| **11** | Technological change | | | | | | | |

# ANNEX 4:
# OCCUPATIONAL DESCRIPTIONS (OD)

**SECTION** : **(C) MANUFACTURING**

**DIVISION** : **(33) REPAIR AND INSTALLATION OF MACHINERY AND EQUIPMENT**

**GROUP** : **(331) REPAIR OF FABRICATED METAL PRODUCT, MACHINERY AND EQUIPMENT**

**MSIC GROUP : 331**

**AREA : REPAIR OF FABRICATED METAL PRODUCTS (HYDRAULIC)**

**LEVEL : 2**

**HYDRAULIC MAINTENANCE TECHNICIAN**

The Hydraulic Maintenance Technician is responsible to expedite assembly works, hands on, work planning preparation with close follow up to ensure daily work are being carry out with no delay and at the highest quality compliance to set procedures and drawings

**Knowledge:**

- Tools, equipment and component for assembly work
- Instructions and working procedure
- Company safety, rules & regulations
- Cost reductions program counter measure for assembly hydraulic
- Installation, repair and maintenance of hydraulic equipment and machinery
- Hydraulics performance testing
- Tests procedures and results
- Components diagnostics and troubleshooting

**Skills:**

- Prepare tools, equipment and component for assembly work
- Determine instructions and working procedure
- Comply with company safety, rules & regulations
- Carry out assembly works
- Identify technical findings at progress capture form
- Support cost reductions program counter measure for assembly hydraulic
- Install, repair and maintain hydraulic equipment and machinery
- Carry out maintenance activities
- Set up test units for performing equipment tests
- Record tests procedures and results
- Ensure the project follows established guidelines
- Diagnostically troubleshoot component defects
- Carry out corrective action
- Report any safety, risk or paper discrepancies to superior

**Attributes (Attitude/Safety/Environmental):**

- Strong interpersonal skills with good attention to details
- High level of commitment and strong team player
- Ability to work under pressure
- Adhere to safety regulations, production quality standard and environmental regulations.

**MSIC GROUP : 331**
**AREA : REPAIR OF FABRICATED METAL PRODUCTS (ELECTRICAL)**
**LEVEL : 3**

**RESPONSIBILITIES**

The Electrical Maintenance Supervisor is responsible to supervise installation, maintaining, and repairing electrical wiring, equipment, and fixtures. Ensure that work is in accordance with relevant codes. May install or service street lights, intercom systems, or electrical control systems.

**Knowledge:**

- Tools, equipment and component for installation and repairing electrical
- Instructions and working procedure
- Company safety, rules & regulations
- Cost reductions program counter measure for electrical
- Installation, repair and maintenance of electrical equipment and machinery
- Electrical performance testing
- Tests procedures and results
- Components diagnostics and troubleshooting
- Follow job specifications and local codes

**Skills:**

- Supervise assembling works, installation, testing, and maintaining electrical or electronic wiring, equipment, appliances, apparatus, and fixtures
- Supervise diagnosing malfunctioning systems, apparatus, and components
- Supervise connecting wires to circuit breakers, transformers, or other components.
- Supervise inspecting electrical systems, equipment, and components
- Advise management on whether continued operation of equipment could be hazardous.
- Supervise testing electrical systems and continuity of circuits in electrical wiring, equipment, and fixtures, using testing devices
- Supervise plan layout and installation of electrical wiring, equipment and fixtures
- Check sketches or follow blueprints
- Supervise repairing or replacing wiring, equipment, and fixtures

**Attributes (Attitude/Safety/Environmental):**

- Strong interpersonal skills with good attention to details
- High level of commitment and strong team player
- Ability to work under pressure
- Adhere to safety regulations, production quality standard and environmental regulations.

**MSIC GROUP : 331**
**AREA : REPAIR OF FABRICATED METAL PRODUCTS (ELECTRICAL)**
**LEVEL : 4**

**RESPONSIBILITIES**

The Electrical Maintenance Assistant Engineer is responsible to assist in designing electrical systems by developing and testing component. They also responsible to planning and managing electrical operation activities

**Knowledge:**

- Tools, equipment and component for installation and repairing electrical
- Instructions and working procedure
- Company safety, rules & regulations
- Cost reductions program counter measure for electrical
- Installation, repair and maintenance of electrical equipment and machinery
- Electrical performance testing
- Tests procedures and results
- Components diagnostics and troubleshooting
- Follow job specifications and local codes

**Skills:**

- Assist in evaluating electrical systems, products, components, and applications
- Assist in confirmation system's and components' capabilities
- Assist in developing electrical products
- Assist in developing manufacturing processes
- Assures product quality
- Assist in preparing product reports
- Assist in providing engineering information
- Assist in maintaining product and company reputation
- Keeps equipment operational
- Maintains product data base
- Completes projects by training and guiding technicians.
- Maintains professional and technical knowledge
- Contributes to team effort

**Attributes (Attitude/Safety/Environmental):**

- Strong interpersonal skills with good attention to details
- High level of commitment and strong team player

- Ability to work under pressure
- Adhere to safety regulations, production quality standard and environmental regulations.

**MSIC GROUP : 331**
**AREA : REPAIR OF FABRICATED METAL PRODUCTS (ELECTRICAL)**
**LEVEL : 5**

**RESPONSIBILITIES**

The Electrical Maintenance Engineer is responsible to design electrical systems by developing and testing component. They also responsible to planning and managing electrical operation activities

**Knowledge:**

- Tools, equipment and component for installation and repairing electrical
- Instructions and working procedure
- Company safety, rules & regulations
- Cost reductions program counter measure for electrical
- Installation, repair and maintenance of electrical equipment and machinery
- Electrical performance testing
- Tests procedures and results
- Components diagnostics and troubleshooting
- Follow job specifications and local codes

**Skills:**

- Evaluates electrical systems, products, components, and applications
- Confirms system's and components' capabilities
- Develops electrical products
- Develops manufacturing processes
- Assures product quality
- Prepares product reports
- Provides engineering information
- Maintains product and company reputation
- Keeps equipment operational
- Maintains product data base
- Completes projects
- Maintains professional and technical knowledge
- Contributes to team effort

**Attributes (Attitude/Safety/Environmental):**

- Strong interpersonal skills with good attention to details
- High level of commitment and strong team player
- Ability to work under pressure
- Adhere to safety regulations, production quality standard and environmental regulations.

- Management skills and problem-solving skills
- Able to time management skills

**MSIC GROUP : 331**
**AREA : REPAIR OF FABRICATED METAL PRODUCTS (ELECTRONIC)**
**LEVEL : 2**

**RESPONSIBILITIES**

The Electronic Maintenance Technician is responsible to assemble or fabricate electronic parts, pieces or products using a variety of tools and equipment according to required specifications in a specific area of a production line in a manufacturing organization.

**Knowledge:**

- Instruction and working procedure
- Company safety, rules & regulations
- Installation, repair and maintenance for electronic equipment
- Connection of electronic component
- Assembly and attaches hardware
- Electronic testing and inspection

**Skills:**

- Assemble electronic components, subassemblies, products, or systems
- Positions and aligns parts in specified relationship to each other in jig, fixture, or other holding device
- Crimps, stakes, screws, bolts, rivets, welds, solders, cements, press fits, or performs similar operations to join or secure parts in place, using hand tools, power tools, machines, and equipment
- Mounts assembled components
- Connects component lead wires to printed circuit or routes and connects wires between individual component leads and other components, connectors, terminals, and contact points
- Installs finished assemblies or subassemblies in cases and cabinets
- Assembles and attaches hardware
- Performs intermediate assembly tasks
- Tends machines that press, shape, or wind component parts
- Adjusts or trims materials from components
- Performs on-line go-not-go testing and inspection
- May perform assembly operations under microscope or other magnifying device

**Attributes (Attitude/Safety/Environmental):**

- Details in preparing equipment and installation works
- Adhere to safety regulations, production quality standard and environmental regulations.

- Good interpersonal skills
- High level of commitment and strong team player

**MSIC GROUP : 331**
**AREA : REPAIR OF FABRICATED METAL PRODUCTS (ELECTRONIC)**
**LEVEL : 3**

**RESPONSIBILITIES**

The Electronic Maintenance Supervisor is responsible to supervise assembling or fabricating electronic parts, pieces or products using a variety of tools and equipment according to required specifications in a specific area of a production line in a manufacturing organization.

**Knowledge:**

- Assembling and fabricating electronic parts
- Adhere to safety and regulation procedures
- Using a proper hand tools and equipment
- Instruction and working procedures
- Testing and inspection requirements
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**

- Supervise assembling electronic components, subassemblies, products, or systems
- Supervise positioning and aligning parts
- Supervise crimps, stakes, screws, bolts, rivets, welds, solders, cements, press fits, or performs similar operations
- Supervise mounting assembled components
- Supervise connecting component lead wires
- Supervise installing finished assemblies or subassemblies in cases and cabinets
- Supervise assembling and attaches hardware
- Supervise performing intermediate assembly tasks
- Supervise tends machines that press, shape, or wind component parts
- Supervise adjusting or trimming materials from components
- Supervise performing on-line go-not-go testing and inspection
- Supervise performing assembly operations under microscope or other magnifying device

**Attributes (Attitude/Safety/Environmental):**

- Details in preparing equipment and supervision works
- Adhere to safety regulations, production quality standard and environmental regulations.
- Good interpersonal skills
- High level of commitment and strong team player
- Ability to supervision skills

**MSIC GROUP : 331**
**AREA : REPAIR OF FABRICATED METAL PRODUCTS (ELECTRONIC)**
**LEVEL : 4**

**RESPONSIBILITIES**

The Electronic Maintenance Assistant Engineer is responsible to assist in research, design, develop, and test electronic components and systems for commercial, industrial, military, or scientific use utilising knowledge of electronic theory and materials properties. Design electronic circuits and components for use in fields such as telecommunications, aerospace guidance and propulsion control, acoustics, or instruments and controls.

**Knowledge:**

- Budget and cost estimates
- Designing electronic components and software, product and systems
- Equipment standards and technical engineering support
- Instruction and engineering task
- Instructions and working procedure
- Company safety, rules & regulations
- Computer-assisted engineering and design software and equipment
- Feasibility of project and develop system plan
- Communication and problem-solving skills
- Effectiveness, technical adequacy and compatibility in the resolution of complex engineering problems.
- Conformance to specifications, safety standards, and applicable codes and regulations
- Confidential descriptions and specifications of proprietary hardware and software, product development and introduction schedules, product costs, and information about product performance weaknesses

**Skills:**

- Assist in reviewing or preparing budget and cost estimates for equipment, construction, and installation projects, and control expenditures.
- Assist in designing electronic components and software, products and systems
- Assist in providing technical support and instruction to staff and customers
- Assist in operating computer-assisted engineering and design software and equipment to perform engineering tasks.
- Assist in analysing system requirements, capacity, cost, and customer needs
- Liaise with another relevant department
- Assist in reviewing and evaluating work of others, inside and outside the organization
- Determine material and equipment needs and order supplies.

- Assist in inspecting electronic equipment, instruments, products, and systems
- Assist in evaluating operational systems, prototypes and proposals and recommend repair or design modifications
- Assist in preparing documentation containing information
- Assist in planning and developing applications and modifications for electronic properties used in components, products, and systems, to improve technical performance.
- Assist in preparing engineering sketches and specifications
- Assist in preparing, reviewing, and maintaining maintenance schedules, designing documentation and operational reports and charts.

**Attributes (Attitude/Safety/Environmental):**

- Good communication and problem-solving with subordinates
- Adhere to safety regulations, production quality standard and environmental regulations.
- Good interpersonal skills
- High level of commitment and strong team player
- Ability to supervision skills
- Good in using computer skills and software
- Meticulous in preparing budget and cost estimates

**MSIC GROUP : 331**
**AREA : REPAIR OF FABRICATED METAL PRODUCTS (ELECTRONIC)**
**LEVEL : 5**

**RESPONSIBILITIES**

The Electronic Maintenance Engineer is responsible to research, design, develop, and test electronic components and systems for commercial, industrial, military, or scientific use utilising knowledge of electronic theory and materials properties. Design electronic circuits and components for use in fields such as telecommunications, aerospace guidance and propulsion control, acoustics, or instruments and controls.

**Knowledge:**

- Budget and cost estimates
- Designing electronic components and software, product and systems
- Equipment standards and technical engineering support
- Instruction and engineering task
- Instructions and working procedure
- Company safety, rules & regulations
- Computer-assisted engineering and design software and equipment
- Feasibility of project and develop system plan
- Communication and problem-solving skills
- Effectiveness, technical adequacy and compatibility in the resolution of complex engineering problems.
- Conformance to specifications, safety standards, and applicable codes and regulations
- Confidential descriptions and specifications of proprietary hardware and software, product development and introduction schedules, product costs, and information about product performance weaknesses

**Skills:**

- Review or prepare budget and cost estimates for equipment, construction, and installation projects, and control expenditures.
- Represent employer at conferences, meetings, boards, panels, committees, and working groups to present, explain, and defend findings and recommendations, negotiate compromises and agreements and exchange information.
- Design electronic components and software, products and systems for commercial, industrial, medical, military, and scientific applications.
- Provide technical support and instruction to staff and customers
- Operate computer-assisted engineering and design software and equipment
- Analyse system requirements, capacity, cost, and customer needs
- Confer with engineers, customers, vendors and others

- Review and evaluate work of others, inside and outside the organization
- Determine material and equipment needs and order supplies.
- Inspect electronic equipment, instruments, products, and systems
- Evaluate operational systems, prototypes and proposals and recommend repair or design modifications
- Prepare documentation containing information
- Direct and coordinate activities concerned with manufacture, construction, installation, maintenance, operation, and modification of electronic equipment, products, and systems.
- Plan and develop applications and modifications for electronic properties
- Prepare engineering sketches and specifications
- Plan and implement research, methodology, and procedures to apply principles of electronic theory to engineering projects.
- Prepare, review, and maintain maintenance schedules, design documentation and operational reports and charts.

**Attributes (Attitude/Safety/Environmental):**

- Good communication and problem-solving with subordinates
- Adhere to safety regulations, production quality standard and environmental regulations.
- Good interpersonal skills
- High level of commitment and strong team player
- Ability to supervision skills
- Good in using computer skills and software
- Meticulous in preparing budget and cost estimates

**MSIC GROUP : 331**
**AREA : REPAIR OF FABRICATED METAL PRODUCTS (MECHANICAL)**
**LEVEL : 2**

**RESPONSIBILITIES**

The Mechanical Maintenance Technician is responsible to assemble or fabricate mechanical parts, pieces or products using a variety of tools and equipment according to required specifications in a specific area of a production line in a manufacturing organisation.

**Knowledge:**

- Engineering equipment and product assembly
- Function of hand tools
- Soldering process procedures
- Instructions and working procedure
- Company safety, rules & regulations
- Quality inspection
- Preparing documentation and compilation report
- Interpreting the engineering specification
- Quality standards and safety procedures
- Housekeeping practices

**Skills:**

- Read, interpret and follow basic blueprints, diagrams, engineering drawings, specifications, bills of materials, and other written instructions or procedures
- Utilise hand held tools
- Performing soldering, which is the process in which two or more metal items are joined together
- Maintain inventory of product in work stations
- Perform quality work checks to insure the product meets quality standards
- Identify product defects and complete appropriate documentation when defects are identified
- Rework and/or repair assembled equipment and products according to engineering specification changes
- Perform all work in accordance with quality standards and established safety procedures
- Maintain a clean and safe work area

**Attributes (Attitude/Safety/Environmental):**

- Good communication
- Adhere to safety regulations, production quality standard and environmental regulations.
- Good interpersonal skills

- Good in using computer skills and software
- Details in checking quality work
- Proactive when maintain clean and safe work area

**MSIC GROUP : 331**
**AREA : REPAIR OF FABRICATED METAL PRODUCTS (MECHANICAL)**
**LEVEL : 3**

**RESPONSIBILITIES**

The Mechanical Maintenance Supervisor is responsible to supervise and monitor assembling or fabricating mechanical parts, pieces or products using a variety of tools and equipment according to required specifications in a specific area of a production line in a manufacturing organisation.

**Knowledge:**

- Engineering equipment and product assembly
- Function of hand tools
- Soldering process procedures
- Instructions and working procedure
- Quality inspection
- Preparing documentation and compilation report
- Interpreting the engineering specification
- Quality standards and safety procedures
- Housekeeping practices
- Supervisory skills

**Skills:**

- Read, interpret and follow basic blueprints, diagrams, engineering drawings, specifications, bills of materials, and other written instructions or procedures
- Utilise hand held tools such as a hand-held screw and drill gun
- Supervise performing soldering, which is the process in which two or more metal items are joined together by melting and flowing a filler metal (solder) into the joint
- Monitor inventory of product in work stations
- Monitor quality work checks to insure the product meets quality standards
- Check and verify product defects and complete appropriate documentation when defects are identified
- Supervise rework and/or repair assembled equipment and products according to engineering specification changes
- Perform all work in accordance with quality standards and established safety procedures
- Monitor a clean and safe work area

**Attributes (Attitude/Safety/Environmental):**

- Good communication
- Adhere to safety regulations, production quality standard and environmental regulations.

- Good interpersonal skills
- Good in using computer skills and software
- Details in checking quality work
- Proactive when supervising subordinate works

**MSIC GROUP : 331**
**AREA : REPAIR OF FABRICATED METAL PRODUCTS (MECHANICAL)**
**LEVEL : 4**

**RESPONSIBILITIES**

The Mechanical Maintenance Assistant Engineer is responsible to assist in designing and planning mechanical and electromechanical products and systems by developing and testing specifications and methods

**Knowledge:**

- Designing and conducting research programs
- Applying principles of mechanics, thermodynamics, hydraulics, heat transfer, and materials
- Studying customer requirements
- Researching and testing manufacturing
- Assembly methods and materials
- Soliciting observations from operators
- Designing testing methods
- Collecting, analysing, and summarising information and trends.
- Complying with government regulations
- Coordinating maintenance and repair services
- Following manufacturer's instructions and established procedures
- Requesting special services.
- Writing computer programs and entering data

**Skills:**

- Assist in evaluating mechanical and electromechanical systems and products
- Assist in developing mechanical and electromechanical products
- Assist in developing manufacturing processes by designing and modifying equipment for fabricating, building, assembling, and installing components.
- Assist in assuring system and product quality
- Assist in preparing product reports
- Assist in providing engineering information
- Maintains product and company reputation
- Keeps equipment operational
- Maintains system and product data base
- Contributes to team effort by accomplishing related results as needed.

**Attributes (Attitude/Safety/Environmental):**

- Good communication and problem-solving skills
- Adhere to safety regulations, production quality standard and environmental regulations.

- Good interpersonal skills
- Proactive when supervising subordinate works

**MSIC GROUP : 331**
**AREA : REPAIR OF FABRICATED METAL PRODUCTS (MECHANICAL)**
**LEVEL : 5**

**RESPONSIBILITIES**

The Mechanical Maintenance Engineer is responsible to design and planning mechanical and electromechanical products and systems by developing and testing specifications and methods

**Knowledge:**

- Designing and conducting research programs
- Applying principles of mechanics, thermodynamics, hydraulics, heat transfer, and materials
- Instructions and working procedure
- Company safety, rules & regulations
- Researching and testing manufacturing
- Assembly methods and materials
- Soliciting observations from operators
- Designing testing methods
- Collecting, analysing, and summarising information and trends.
- Complying with government regulations
- Coordinating maintenance and repair services
- Following manufacturer's instructions and established procedures
- Requesting special services.
- Writing computer programs and entering data

**Skills:**

- Evaluates mechanical and electromechanical systems and products
- Confirms system and product capabilities
- Develops mechanical and electromechanical products
- Develops manufacturing processes
- Assures system and product quality
- Prepares product reports
- Provides engineering information
- Maintains product and company reputation
- Keeps equipment operational
- Maintains system and product data base
- Contributes to team effort

**Attributes (Attitude/Safety/Environmental):**

- Good communication and problem-solving skills
- Adhere to safety regulations, production quality standard and environmental regulations.

- Good interpersonal skills
- Proactive when supervising subordinate works

**MSIC GROUP : 331**
**AREA : REPAIR OF MACHINERY (WEAPON TECHNOLOGY & MANAGEMENT)**
**LEVEL : 2**

**RESPONSIBILITIES**

The armourer responsible to provide servicing and inspecting a variety of firearms used by the force or are temporarily confiscated. The responsibilities also include weapon inspection and testing, together with related inventory and records clerical work and provide departmental expertise in weapon ammunition reloading and in recommending suitable ammunition use.

**Knowledge:**

- Restoring and preparing exhibits of medieval arms and armour
- Instructions and working procedure
- Company safety, rules & regulations
- Assembly parts of armour
- Design and fabricating the broken parts
- Conducting research
- Firearm training
- Record and weapon inventory
- Repairing and reloading equipment and firearms
- Weapon ammunition reloading
- Weapon inspection and testing

**Skills:**

- Specializes in restoring and preparing exhibits
- Assembles parts of armour, helmets, guns, swords, and similar items.
- Designs and fabricates missing or broken parts.
- Conducts research to determine authenticity and classifies and catalogs articles.
- Prepares articles for exhibition.
- Inspects and tests new or seized firearms.
- Reloads ammunition for firearms training.
- Maintains records and weapon inventory.
- Performs repairs to reloading equipment and firearms.
- Provides expert court evidence relating to firearms expertise.

**Attributes (Attitude/Safety/Environmental):**

- Good communication
- Adhere to safety regulations, production quality standard and environmental regulations.
- Good interpersonal skills

- Meticulous in checking inventory and maintain records
- Use a proper Personal Protective Equipment (PPE) when handling equipment

**MSIC GROUP : 331**
**AREA : REPAIR OF MACHINERY (WEAPON TECHNOLOGY & MANAGEMENT)**
**LEVEL : 3**

**RESPONSIBILITIES**

The senior armourer responsible to supervise the servicing and inspecting a variety of firearms used by the force or are temporarily confiscated. They also responsible for check and supervise the weapon inspection and testing, together with related inventory and records clerical work

**Knowledge:**

- Restoring and preparing exhibits of medieval arms and armour
- Instructions and working procedure
- Company safety, rules & regulations
- Assembly parts of armour
- Design and fabricating the broken parts
- Firearm training
- Record and weapon inventory
- Repairing and reloading equipment and firearms
- Weapon ammunition reloading
- Weapon inspection and testing

**Skills:**

- Specializes in restoring and preparing exhibits of medieval arms and armour
- Check assembles parts of armour, helmets, guns, swords, and similar items.
- Check Designs and fabricates missing or broken parts.
- Conducts research to determine authenticity and classifies and catalogues articles.
- Check new or seized firearms testing.
- Check reloads ammunition for firearms training.
- Supervise records and weapon inventory.
- Supervise repairs to reloading equipment and firearms.
- Provides expert court evidence relating to firearms expertise.

**Attributes (Attitude/Safety/Environmental):**

- Good communication
- Adhere to safety regulations, production quality standard and environmental regulations.
- Good interpersonal skills
- Proactive when supervising subordinate works
- Meticulous in checking inventory and maintain records
- Supervisory skills
- Use a proper Personal Protective Equipment (PPE) when handling equipment

**MSIC GROUP : 331**
**AREA : REPAIR OF MACHINERY (WEAPON TECHNOLOGY & MANAGEMENT)**
**LEVEL : 4**

**RESPONSIBILITIES**

The armourer officer responsible to repair and adjust hydraulic mechanical systems, maintain records and prepare required report

**Knowledge:**

- Hydraulic and mechanical systems
- Instructions and working procedure
- Company safety, rules & regulations
- Breech and firing mechanisms
- Services recoil mechanisms.
- Testing, diagnostic and troubleshooting techniques
- Turret electronic systems
- Communication skills

**Skills:**

- Repairs and adjusts hydraulic and mechanical systems
- Repairs turret electronic systems.
- Identifies and submits required documents for repair part(s) requests.
- Maintains records, prepares and submits required reports
- Monitors, assigns and supervises Section workflow
- Able to operate Direct Support and General Support specific test and diagnostic equipment related to electronic components.
- Trouble shoots and repairs equipment
- Performs other duties as required.

**Attributes (Attitude/Safety/Environmental):**

- Good communication
- Adhere to safety regulations, production quality standard and environmental regulations.
- Good interpersonal skills
- Proactive when supervising subordinate works
- Meticulous in troubleshooting and repairing equipment
- Use a proper Personal Protective Equipment (PPE) when handling equipment

**MSIC GROUP : 331**
**AREA : REPAIR OF MACHINERY (AMMUNITION & EXPLOSIVE MANAGEMENT)**
**LEVEL : 2**

**RESPONSIBILITIES**

The ammo & explosive technician responsible to manage the storage of ammunition and explosives and perform render safe and disposal procedures on explosive ordnances

**Knowledge:**

- Storage of ammunition and explosive
- Instructions and working procedure
- Company safety, rules & regulations
- Render safe
- Disposal procedures on explosive ordnances
- Safety and environmental procedures

**Skills:**

- Provide advice on all ammunition and explosive safety matters
- Manage the storage of ammunition and explosives
- Prepare and ship ammunition and explosives
- Maintain static facilities, field and deployed installations
- Perform render safe and disposal procedures on explosive ordnances
- Certify ammunition, explosive items, munitions and non-munitions scrap to different degrees of classification
- Conduct improvised explosive devices disposal operations
- Operate equipment in support of operations

**Attributes (Attitude/Safety/Environmental):**

- Good communication
- Adhere to safety regulations, production quality standard and environmental regulations.
- Good interpersonal skills
- Proactive when supervising subordinate works
- Meticulous in operating equipment
- Use a proper Personal Protective Equipment (PPE) when handling equipment

**MSIC GROUP : 331**
**AREA : REPAIR OF MACHINERY (AMMUNITION & EXPLOSIVE MANAGEMENT)**
**LEVEL : 3**

**RESPONSIBILITIES**

The ammo & explosive supervisor responsible to ensure that ordinance movements and requisitions are completed and fulfilled regulations requirements

**Knowledge:**

- Ordnances movement and requisitions
- Instructions and working procedure
- Company safety, rules & regulations
- Regulations requirements
- Safety and environmental procedures
- Ordnance Information System (OIS)
- NARs (Notice of Ammunition Reclassification)
- Inventory management records

**Responsibilities may include:**

- Ensure that ordnance movements are completed on schedule and per regulations.
- Ensure that ordnance requisitions are fulfilled as directed.
- Maintain inventory management records.
- Ensure processing of transactions involving ordnance.
- Maintain stockage levels, conduct location reconciliation
- Update and reconcile the Ordnance Information System (OIS)
- Create requisitions and process NARs (Notice of Ammunition Reclassification

**Attributes (Attitude/Safety/Environmental):**

- Good communication
- Adhere to safety regulations, production quality standard and environmental regulations.
- Good interpersonal skills
- Proactive when supervising subordinate works
- Meticulous in maintaining inventory management records
- Use a proper Personal Protective Equipment (PPE) when handling equipment

**MSIC GROUP : 331**
**AREA : REPAIR OF MACHINERY (AMMUNITION & EXPLOSIVE MANAGEMENT)**
**LEVEL : 4**

**RESPONSIBILITIES**
The ammo & explosive executive responsible to operate Direct Support and General Support specific test, troubleshoot, repairs and diagnostic equipment related to electronic components

**Knowledge:**
- Testing, troubleshooting, repairing and diagnostic electronic equipment
- Instructions and working procedure
- Company safety, rules & regulations
- Hydraulic and mechanical systems
- Breech and firing mechanisms
- Services recoil mechanisms.
- Testing, diagnostic and troubleshooting techniques
- Turret electronic systems
- Communication skills

**Skills:**
- Repairs and adjusts hydraulic and mechanical systems
- Adjusts breech and firing mechanisms; services recoil mechanisms
- Applies diagnostic and troubleshooting techniques to determine cause(s) of malfunctions
- Repairs turret electronic systems.
- Identifies and submits required documents for repair part(s) requests.
- Maintains records, prepares and submits required reports
- Monitors, assigns and supervises Section workflow
- Able to operate Direct Support and General Support specific test and diagnostic equipment related to electronic components.
- Trouble shoots and repairs equipment
- Performs other duties as required.

**Attributes (Attitude/Safety/Environmental):**
- Apply good communication
- Adhere to safety regulations, production quality standard and environmental regulations.
- Good interpersonal skills
- Meticulous in maintaining inventory management records
- Meticulous in handling electronic equipment
- Use a proper Personal Protective Equipment (PPE) when handling equipment

**MSIC GROUP : 331**
**AREA : REPAIR OF MACHINERY (AMMUNITION & EXPLOSIVE MANAGEMENT)**
**LEVEL : 4**

**RESPONSIBILITIES**
The ammo & explosive senior executive responsible to analyse data and use it to create reports on industry trends, which are then submitted to managers and used to develop business plans and maintain good relationships

**Knowledge:**
- Ammunition and explosive management
- Analysing reports on industry trends using business plans
- Instructions and working procedure
- Company safety, rules & regulations
- Leadership skills
- Project management
- Safety and environmental procedures and compliances

**Skills:**
- Analyse data and use it to create reports
- Maintain good relationships with customers and clients and develop new relationships when the opportunities present themselves.
- Organise and attend client meetings as well as meetings for internal staff.
- Create and maintain a variety of documents
- Facilitate good communication between and provide leadership for teams working on a project, including the marketing, research and development, and testing teams.
- Report project details and progress to the appropriate manager on a regular basis.
- Track project schedules
- Set specific goals for projects

**Attributes (Attitude/Safety/Environmental):**
- Apply good communication
- Adhere to safety regulations, quality standard and environmental regulations.
- Good interpersonal skills
- Meticulous in maintaining records
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Proactive in handling subordinates work

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (SHIPS ELECTRONIC SYSTEM)**
**LEVEL : 2**

**RESPONSIBILITIES**

The Ship Electronic System Installation & Maintenance Fitter is responsible to operate switch gear, carry out preventive maintenance, installation, repairing and troubleshooting. He also has to comply with quality assurance & control procedures and adhere to safety, health & environmental requirements.

**Knowledge:**

- Installation, repairing and troubleshooting ship electronic system
- Quality assurance & control procedures compliance
- Instructions and working procedure
- Company safety, rules & regulations
- Safety, health and environmental requirements
- Tools equipment and material preparation
- Preventive maintenance

**Skills:**

- Adhere to Safety, Health & Environmental (SHE) requirements.
- Carry out tools, equipment & materials preparation.
- Carry out switch gear operation.
- Carry out electronic preventive maintenance activities.
- Carry out electronic repairing.
- Carry out electronic installation activities.
- Adhere to quality assurance & quality control procedures.
- Carry out electronic troubleshooting.
- Update activities checklist

**Attributes (Attitude/Safety/Environmental):**

- Apply good communication
- Adhere to safety regulations, quality standard and environmental regulations.
- Good interpersonal skills
- Meticulous in updating activities records
- Use a proper Personal Protective Equipment (PPE) when handling equipment

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (SHIPS ELECTRONIC SYSTEM)**
**LEVEL : 3**

**RESPONSIBILITIES**

The Ship Electronic System Installation & Maintenance Supervisor is responsible to supervise switch gear operations, supervise preventive maintenance, installation, repairing and troubleshooting, perform electronic testing & commissioning and perform electronic equipment inspection & calibration. He also has to comply with quality assurance & control procedures and adhere to safety, health & environmental requirements.

**Knowledge:**

- Electronic testing & commissioning
- Electronic equipment inspection and calibration
- Installation, repairing and troubleshooting ship electronic system
- Instructions and working procedure
- Company safety, rules & regulations
- Preventive maintenance
- Quality assurance & control procedures compliance
- Safety, health and environmental requirements
- Tools equipment and material preparation

**Skills:**

- Adhere to Safety, Health & Environmental (SHE) requirements.
- Supervise tools, equipment & materials preparation.
- Supervise switch gear operations.
- Supervise electronic preventive maintenance activities.
- Supervise electronic repairing.
- Supervise electronic installation activities.
- Adhere to quality assurance & quality control procedures.
- Supervise electronic troubleshooting.
- Perform electronic testing & commissioning.
- Perform electronic equipment inspection & calibration.
- Check activities checklist.

**Attributes (Attitude/Safety/Environmental):**

- Apply good communication

- Adhere to safety regulations, quality standard and environmental regulations.
- Good interpersonal skills
- Meticulous in updating activities records
- Use a proper Personal Protective Equipment (PPE) when handling equipment

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (SHIPS ELECTRONIC SYSTEM)**
**LEVEL : 4**

**RESPONSIBILITIES**

The Ship Electronic System Installation & Maintenance Assistant Engineer is responsible to coordinate switch gear operations, coordinate preventive maintenance, installation, repairing and troubleshooting, verify electronic testing & commissioning and verify electronic equipment inspection & calibration. He also has to comply with quality assurance & control procedures and adhere to safety, health & environmental requirements.

**Knowledge:**

- Electronic testing & commissioning
- Electronic equipment inspection and calibration
- Installation, repairing and troubleshooting ship electronic system
- Instructions and working procedure
- Company safety, rules & regulations
- Preventive maintenance
- Quality assurance & control procedures compliance
- Tools equipment and material management

**Skills:**

- Adhere to Safety, Health & Environmental (SHE) requirements.
- Coordinate tools, equipment & materials availability.
- Coordinate switch gear operations.
- Coordinate electronic preventive maintenance activities.
- Coordinate electronic repairing.
- Coordinate electronic installation activities.
- Perform quality assurance & quality control procedures.
- Coordinate electronic troubleshooting.
- Verify electronic equipment inspection & calibration.
- Verify electronic testing & commissioning.
- Verify activities checklist

**Attributes (Attitude/Safety/Environmental):**

- Apply good communication and problem-solving skills
- Adhere to safety regulations, quality standard and environmental regulations.
- Good interpersonal skills
- Meticulous in verifying activities records

- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Meticulous in coordinating electronic installation operations

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (SHIPS ELECTRONIC SYSTEM)**
**LEVEL : 5**

**RESPONSIBILITIES**

The Ship Electronic System Installation & Maintenance Engineer is responsible to monitor & control switch gear operation, plan & organise preventive maintenance, installation, repairing and troubleshooting, manage electronic testing & commissioning and review & endorse electronic equipment inspection & calibration. He also has to comply with quality assurance & control procedures and adhere to safety, health & environmental requirements.

**Knowledge:**

- Electronic testing & commissioning
- Electronic equipment inspection and calibration
- Installation, repairing and troubleshooting ship electronic system
- Instructions and working procedure
- Company safety, rules & regulations
- Preventive maintenance
- Quality assurance & control procedures compliance
- Safety, health and environmental requirements
- Tools equipment and material management

**Skills:**

- Adhere to Safety, Health & Environmental (SHE) requirements.
- Evaluate & endorse tools, equipment & materials procurements.
- Monitor & control switch gear operation.
- Plan & organise electronic preventive maintenance activities.
- Plan & organise electronic repairing.
- Monitor & control electronic installation activities.
- Adhere to quality assurance & quality control procedures.
- Monitor & control electronic troubleshooting.
- Review & endorse design adjustment.
- Review & endorse electronic equipment inspection & calibration.
- Manage electronic testing & commissioning.
- Endorse activities checklist

**Attributes (Attitude/Safety/Environmental):**

- Apply good communication and problem-solving skills
- Adhere to safety regulations, quality standard and environmental regulations.

- Good interpersonal skills
- Meticulous in endorsing activities records
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Meticulous in planning and monitoring electronic installation operations

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (SHIPS ELECTRICAL SYSTEM)**
**LEVEL : 2**

**RESPONSIBILITIES**

The Ship Electrical System Installation & Maintenance Fitter is responsible to operate switch gear, carry out preventive maintenance, installation, repairing and troubleshooting. He also has to comply with quality assurance & control procedures and adhere to safety, health & environmental requirements.

**Knowledge:**

- Installation, repairing and troubleshooting ship electrical system
- Quality assurance & control procedures compliance
- Safety, health and environmental requirements
- Tools equipment and material preparation
- Preventive maintenance
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**

- Adhere to Safety, Health & Environmental (SHE) requirements.
- Carry out tools, equipment & materials preparation.
- Carry out switch gear operation.
- Carry out electrical preventive maintenance activities.
- Carry out electrical repairing.
- Carry out electrical installation activities.
- Adhere to quality assurance & quality control procedures.
- Carry out electrical troubleshooting.
- Update activities checklist

**Attributes (Attitude/Safety/Environmental):**

- Apply good communication
- Adhere to safety regulations, quality standard and environmental regulations.
- Good interpersonal skills
- Meticulous in updating activities records
- Use a proper Personal Protective Equipment (PPE) when handling equipment

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (SHIPS ELECTRICAL SYSTEM)**
**LEVEL : 3**

**RESPONSIBILITIES**

The Ship Electrical System Installation & Maintenance Supervisor is responsible to supervise switch gear operations, supervise preventive maintenance, installation, repairing and troubleshooting, perform electrical testing & commissioning and perform electrical equipment inspection & calibration. He also has to comply with quality assurance & control procedures and adhere to safety, health & environmental requirements.

**Knowledge:**

- Electric testing & commissioning
- Electric equipment inspection and calibration
- Installation, repairing and troubleshooting ship Electric system
- Instructions and working procedure
- Company safety, rules & regulations
- Preventive maintenance
- Quality assurance & control procedures compliance
- Safety, health and environmental requirements
- Tools equipment and material preparation

**Skills:**

- Adhere to Safety, Health & Environmental (SHE) requirements.
- Supervise tools, equipment & materials preparation.
- Supervise switch gear operations.
- Supervise electrical preventive maintenance activities.
- Supervise electrical repairing.
- Supervise electrical installation activities.
- Adhere to quality assurance & quality control procedures.
- Supervise electrical troubleshooting.
- Perform electrical testing & commissioning.
- Perform electrical equipment inspection & calibration.
- Check activities checklist.

**Attributes (Attitude/Safety/Environmental):**

- Apply good communication

- Adhere to safety regulations, quality standard and environmental regulations.
- Good interpersonal skills
- Meticulous in updating activities records
- Use a proper Personal Protective Equipment (PPE) when handling equipment

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (SHIPS ELECTRICAL SYSTEM)**
**LEVEL : 4**

**RESPONSIBILITIES**

The Ship Electrical System Installation & Maintenance Assistant Engineer is responsible to coordinate switch gear operations, coordinate preventive maintenance, installation, repairing and troubleshooting, verify electrical testing & commissioning and verify electrical equipment inspection & calibration. He also has to comply with quality assurance & control procedures and adhere to safety, health & environmental requirements.

**Knowledge:**

- Electrical testing & commissioning
- Electrical equipment inspection and calibration
- Installation, repairing and troubleshooting ship electrical system
- Instructions and working procedure
- Company safety, rules & regulations
- Preventive maintenance
- Quality assurance & control procedures compliance
- Safety, health and environmental requirements
- Tools equipment and material management

**Skills:**

- Adhere to Safety, Health & Environmental (SHE) requirements.
- Coordinate tools, equipment & materials availability.
- Coordinate switch gear operations.
- Coordinate electrical preventive maintenance activities.
- Coordinate electrical repairing.
- Coordinate electrical installation activities.
- Perform quality assurance & quality control procedures.
- Coordinate electrical troubleshooting.
- Verify electrical equipment inspection & calibration.
- Verify electrical testing & commissioning.
- Verify activities checklist

**Attributes (Attitude/Safety/Environmental):**

- Apply good communication and problem-solving skills
- Adhere to safety regulations, quality standard and environmental regulations.
- Good interpersonal skills

- Meticulous in verifying activities records
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Meticulous in coordinating electrical installation operations

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (SHIPS ELECTRICAL SYSTEM)**
**LEVEL : 5**

**RESPONSIBILITIES**

The Ship Electrical System Installation & Maintenance Engineer is responsible to monitor & control switch gear operation, plan & organise preventive maintenance, installation, repairing and troubleshooting, manage electrical testing & commissioning and review & endorse electrical equipment inspection & calibration. He also has to comply with quality assurance & control procedures and adhere to safety, health & environmental requirements.

**Knowledge:**

- Electrical testing & commissioning
- Electrical equipment inspection and calibration
- Installation, repairing and troubleshooting ship electrical system
- Instructions and working procedure
- Company safety, rules & regulations
- Preventive maintenance
- Quality assurance & control procedures compliance
- Safety, health and environmental requirements
- Tools equipment and material management

**Skills:**

- Adhere to Safety, Health & Environmental (SHE) requirements.
- Evaluate & endorse tools, equipment & materials procurements.
- Monitor & control switch gear operation.
- Plan & organise electrical preventive maintenance activities.
- Plan & organise electrical repairing.
- Monitor & control electrical installation activities.
- Adhere to quality assurance & quality control procedures.
- Monitor & control electrical troubleshooting.
- Review & endorse design adjustment.
- Review & endorse electrical equipment inspection & calibration.
- Manage electrical testing & commissioning.
- Endorse activities checklist

**Attributes (Attitude/Safety/Environmental):**

- Apply good communication and problem-solving skills

- Adhere to safety regulations, quality standard and environmental regulations.
- Good interpersonal skills
- Meticulous in endorsing activities records
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Meticulous in planning and monitoring electrical installation operations

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES**
**LEVEL : 2**

**RESPONSIBILITIES**

The Aviation Mechanical Technician is responsible to for the daily aircrafts maintenance. They verify the aircraft conformity and the state of its engine or cockpit pieces. They maintain the aircraft, repair the reported defects and ensure the plane service so it can leave in confidence.

**Knowledge:**

- Daily aircrafts maintenance
- Aircraft conformity
- Installation, repairing and testing aircraft
- Component or parts aircraft defects
- Rules and regulation for aircraft
- Safety, health and environment procedures
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**

- Use technical documentation
- Configure the working environment to prepare for the operation
- Installing and removing aircraft parts, integration, modification and repair, audit, diagnostic, test and evaluation
- Tests and settings, control and quality
- Deliver the Certificate of Release to Service (LMA)
- Participate to all engineering stages (organization, conception, verification, etc.) (HND)
- Independently ensure the technical support for customers (HND)

**Attributes (Attitude/Safety/Environmental):**

- Meticulous in checking aircraft defects
- Meticulous in preparing technical documentation
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Apply good communication
- To have an ability work in a team
- Adhere to safety regulations, quality standard and environmental regulations.
- Good interpersonal skills

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES**
**LEVEL : 3**

**RESPONSIBILITIES**

The Aviation Mechanical Supervisor is responsible for maintenance functions of assigned aircraft and is responsible for supervising day-to-day maintenance tasks on the aircraft, support equipment, and special tools.

**Knowledge:**

- Aircraft maintenance scheduling
- Maintenance operation tasking
- Modification/upgrading various aircraft systems
- Feasibility and method of repairing or replacing malfunctioning or damaged components
- Manufacturers' and company's maintenance manuals
- Technical orders, checklists, and hazardous materials.
- Monitoring parts and supply inventories
- Aircraft/equipment movement
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**

- Manage all aspects of aircraft maintenance
- Supervise maintenance staff
- Perform scheduled/unscheduled maintenance, servicing, launch and recovery, corrosion control, and inspection, and routine
- Review work orders regarding modifications and/or upgrades to various aircraft systems.
- Read and interpret manufacturers' and company's maintenance manuals, service bulletins, and other specifications
- Adjust, repair, or replace electrical wiring system and aircraft accessories
- Provide guidance and instruction
- Responsible for maintaining equipment maintenance schedules
- Ensure availability of materials, anticipating requirements and reordering.
- Offer technical guidance to Engineering staff regarding start-up of new equipment and follow-up of maintenance programs.
- Provide employees with proper training on company equipment as required by OSHA Regulations and monitors annual training requirements.
- May supervise and assist in aircraft/equipment movement.
- May conduct flight line and hangar foreign object damage prevention walks and housekeeping.

- May meet with Customers and Company Senior Leadership as required.
- Perform other qualified duties as assigned.

**Attributes (Attitude/Safety/Environmental):**

- Meticulous in interpreting manufacturers and company's maintenance manual
- Meticulous in maintaining equipment maintenance schedules
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Apply good communication
- To have an ability work in a team
- Adhere to safety regulations, quality standard and environmental regulations.
- Good interpersonal skills

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AIRCRAFT MECHANICAL)**
**LEVEL : 4**

**RESPONSIBILITIES**

The Aviation Mechanical Assistant Engineer is responsible to assist in ensuring an aircraft operates properly and safely. A maintenance assistant engineer may make repairs, troubleshoot problems, conduct inspections and assist in making upgrades to aircrafts.

**Knowledge:**

- Aircraft operation
- Repairing, troubleshooting and inspection of aircraft systems
- Aircraft system upgrading
- Aircraft performance testing
- Inspection and investigating aircraft issues
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**

- Check the assembly of aircraft systems and engines
- Assist in testing aircraft to measure performance and identify areas for improvement
- Assist in developing design specifications for aircraft systems
- Applying scientific principles to improve the performance of aircraft
- Assist in researching the environmental impact of aircraft and taking action to minimise this
- Assist in investigating problems with aircraft or the causes of accidents
- Assist in creating reports for clients and providing technical advice
- Maintaining aircraft and carrying out regular inspections

**Attributes (Attitude/Safety/Environmental):**

- Meticulous in investigating aircraft issues
- Meticulous in maintaining equipment aircraft and regular inspections
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Apply good communication and problem-solving skills
- To have an ability work in a team
- Adhere to safety regulations, quality standard and environmental regulations.
- Good interpersonal skills
- Proactive in identifying aircraft areas of improvement

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AIRCRAFT MECHANICAL)**
**LEVEL : 5**

**RESPONSIBILITIES**

The Aviation Mechanical Engineer is responsible to ensuring an aircraft operates properly and safely. They may make repairs, troubleshoot problems, conduct inspections and make upgrades to aircrafts.

**Knowledge:**

- Aircraft operation
- Repairing, troubleshooting and inspection of aircraft systems
- Aircraft system upgrading
- Aircraft performance testing
- Inspection and investigating aircraft issues
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**

- Supervising the assembly of aircraft systems and engines
- Testing aircraft to measure performance and identify areas for improvement
- Developing design specifications for aircraft systems
- Applying scientific principles to improve the performance of aircraft
- Researching the environmental impact of aircraft and taking action to minimise this
- Investigating problems with aircraft or the causes of accidents
- Creating reports for clients and providing technical advice
- Maintaining aircraft and carrying out regular inspections

**Attributes (Attitude/Safety/Environmental):**

- Meticulous in testing aircraft performance
- Meticulous in maintaining equipment aircraft and regular inspections
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Apply good communication and problem-solving skills
- To have an ability work in a team
- Adhere to safety regulations, quality standard and environmental regulations.
- Good interpersonal skills
- Proactive in identifying aircraft areas of improvement

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AIRCRAFT ENGINES)**
**LEVEL : 2**

**RESPONSIBILITIES**
The Aircraft Engine Maintenance Technician is responsible to provide effective engineering and maintenance services covering the rolling stock and maintenance vehicle

**Knowledge:**
- Preventive and corrective maintenance activities
- Routine vehicle inspection
- Equipment functionality testing
- Operational specifications and tolerances
- Operating rules and procedures
- Maintenance procedures and instructions
- Maintenance record activities
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**
- Assist the supervisor in carrying out all level of preventive and corrective maintenance activities and minor modifications on stock
- Carry out routine vehicle inspections, inspecting parts for surface defects, changing of consumable items, perform minor repairs and technical cleaning;
- Perform roles necessary for the management of the safe system of works, including to meet tight maintenance schedules;
- Test functional performance of electromechanical assemblies using various test instruments, replace, install electrical and electronic parts and hardware in housings or assemblies, align, fit, and assemble component parts, using electronics tools, hand tools, power tools, fixtures, templates, and microscopes;
- Operate metalworking machines, repair, rework, and calibrate hydraulic and pneumatic assemblies and systems, verify dimensions and clearances of parts to ensure conformance to specifications and to meet operational specifications and tolerances;
- Perform time sensitive fault diagnostics and component replacement (repair in site or inside depot) on the stock;
- Follow the appropriate maintenance procedures and instructions, operating rules and procedures to ensure compliance with the required requirements;

- Carry out wheel truing of the stock annually or as required using under-floor wheel lathe, perform bogie overhaul at every four and eight years by inspecting and repairing major bogie components such as traction motors, gear-boxes, wheel-sets, and axle boxes in special purpose-built workshops;
- Assist the supervisor and/ or other technical support staff to implement complex systems or new projects;
- Produce and maintain accurate maintenance records of stock, tools and plant machinery performance, work accomplished and other information using a computerized maintenance management system;
- Implement and follow Permit to Work process;
- Perform shift and emergency duties when required.

**Attributes (Attitude/Safety/Environmental):**

- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Apply good communication
- To have an ability work in a team
- Adhere to safety regulations, quality standard and environmental regulations.
- Good interpersonal skills
- Proactive in maintaining maintenance record
- Meticulous in testing functional performance
- Meticulous in carrying out routine vehicle inspections
- Meticulous in performing time sensitive fault diagnostics and component replacement

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AIRCRAFT ENGINES)**
**LEVEL : 3**

**RESPONSIBILITIES**
The Aircraft Engine Maintenance Supervisor is responsible to supervise the effective engineering and maintenance services covering the rolling stock and maintenance vehicle

**Knowledge:**
- Preventive and corrective maintenance activities
- Routine vehicle inspections
- Maintenance scheduling
- Functional performance of electromechanical assemblies
- Operation of metalworking machines
- Fault diagnostics and component replacement
- Maintenance records
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**
- Supervise preventive and corrective maintenance activities and minor modifications on stock
- Check and supervise routine vehicle inspections, inspecting parts for surface defects, changing of consumable items, perform minor repairs and technical cleaning;
- Prepare maintenance scheduling
- Check functional performance of electromechanical assemblies
- Supervise operation of metalworking machines, repair, rework, and calibrate hydraulic and pneumatic assemblies and systems, verify dimensions and clearances of parts to ensure conformance to specifications and to meet operational specifications and tolerances;
- Supervise time sensitive fault diagnostics and component replacement (repair in site or inside depot) on the stock;
- Follow the appropriate maintenance procedures and instructions, operating rules and procedures to ensure compliance with the required requirements;
- Check wheel truing of the stock annually or as required
- Implement complex systems or new projects;
- Check maintenance records

**Attributes (Attitude/Safety/Environmental):**

- Proactive in checking maintenance record
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Apply good communication
- To have an ability work in a team
- Adhere to safety regulations, quality standard and environmental regulations.
- Good interpersonal skills

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AIRCRAFT ENGINES-TURBINES)**
**LEVEL : 4**

**RESPONSIBILITIES**
The Aircraft Turbine Engine Maintenance Assistant Engineer is responsible to assist in plan, design and oversee the development, assembly, installation, operation and maintenance of trains (turbine stock), equipment and mechanical services from concept to delivery

**Knowledge:**
- Operation and maintenance of rolling stock
- Installation of new trains and refurbishment
- Equipment and mechanical services
- Train maintenance and installation procedures and guidelines
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**
- Assist in plan and coordinate roll stock maintenance projects with the aim of improving the security, reliability, service, condition and comfort of the facilities.
- Assist in plan, coordinate and carry out projects relating to the installation of new trains and refurbishment.
- Assist in providing technical support and helping to implement new projects.
- Assist in perform maintenance on the turbine stock fleet.
- Assist in train maintenance and installation procedures and guidelines established are properly adhered to both internally and by external suppliers.
- Interpret information related to incidents or repairs and draw up reports that determine the state of the turbine stock fleet. To act on the basis of these reports, suggesting new projects with the aim of improving the state of the fleet.

**Attributes (Attitude/Safety/Environmental):**
- Meticulous in interpreting information of turbine stock fleet
- Proactive in coordinating installation works
- Meticulous in planning and coordinating stock maintenance
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Apply good communication and problem-solving skills
- To have an ability work in a team
- Adhere to safety regulations, quality standard and environmental regulations.

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AIRCRAFT ENGINES-TURBINES)**
**LEVEL : 5**

**RESPONSIBILITIES**

The Aircraft Turbine Engine Maintenance Engineer is responsible to plan, design and oversee the development, assembly, installation, operation and maintenance of trains (turbine stock), equipment and mechanical services from concept to delivery

**Knowledge:**

- Operation and maintenance of rolling stock
- Installation of new trains and refurbishment
- Equipment and mechanical services
- Train maintenance and installation procedures and guidelines
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**

- Plan and coordinate turbine stock maintenance projects with the aim of improving the security, reliability, service, condition and comfort of the facilities.
- Plan, coordinate and carry out projects relating to the installation of new trains and refurbishment.
- Assist turbine stock depots, both providing technical support and helping to implement new projects.
- Manage the work teams that perform maintenance on the turbine stock fleet.
- Ensure that the train maintenance and installation procedures and guidelines established are properly adhered to both internally and by external suppliers.
- Serve as the turbine stock expert when participating in technical projects led by other departments of the company.
- Interpret information related to incidents or repairs and draw up reports that determine the state of the turbine stock fleet. To act on the basis of these reports, suggesting new projects with the aim of improving the state of the fleet.

**Attributes (Attitude/Safety/Environmental):**

- Meticulous in interpreting information of turbine stock fleet
- Proactive in managing installation works
- Meticulous in planning and coordinating stock maintenance
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Apply good communication and problem-solving skills

- To have an ability work in a team
- Adhere to safety regulations, quality standard and environmental regulations.
- Good interpersonal skills

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AIRCRAFT ENGINES-ROTOCRAFT)**
**LEVEL : 4**

**RESPONSIBILITIES**
The Aircraft Rotocraft Engine Maintenance Assistant Engineer is responsible to assist in plan, design and oversee the development, assembly, installation, operation and maintenance of trains (rotocraft stock), equipment and mechanical services from concept to delivery

**Knowledge:**
- Planning and designing development of aircraft maintenance
- Operation and maintenance of rotocraft stock
- Equipment and mechanical services
- Rotocraft stock maintenance scheduling
- Maintenance and installation procedures and guidelines
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**
- Assist in plan and coordinate rotocraft stock maintenance projects with the aim of improving the security, reliability, service, condition and comfort of the facilities.
- Assist in plan, coordinate and carry out projects relating to the installation of new trains and refurbishment.
- Assist in providing technical support and helping to implement new projects.
- Assist in perform maintenance on the rotocraft stock fleet.
- Assist in train maintenance and installation procedures and guidelines established are properly adhered to both internally and by external suppliers.
- Interpret information related to incidents or repairs and draw up reports that determine the state of the rotocraft stock fleet. To act on the basis of these reports, suggesting new projects with the aim of improving the state of the fleet.

**Attributes (Attitude/Safety/Environmental):**
- Meticulous in interpreting information of rotocraft stock fleet
- Proactive in coordinating installation works
- Meticulous in planning and coordinating stock maintenance
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Apply good communication and problem-solving skills
- To have an ability work in a team

- Adhere to safety regulations, quality standard and environmental regulations.
- Good interpersonal skills

**MSIC GROUP : 331**
**AREA : REPAIR OF TRANSPORT EQUIPMENT, EXCEPT MOTOR VEHICLES (AIRCRAFT ENGINES-ROTOCRAFT)**
**LEVEL : 5**

**RESPONSIBILITIES**

The Aircraft Rotocraft Engine Maintenance Engineer is responsible to plan, design and oversee the development, assembly, installation, operation and maintenance of trains (rolling stock), equipment and mechanical services from concept to delivery

**Knowledge:**

- Planning and designing development of aircraft maintenance
- Operation and maintenance of rotocraft stock
- Equipment and mechanical services
- Rotocraft stock maintenance scheduling
- Maintenance and installation procedures and guidelines
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**

- Plan and coordinate roll stock maintenance projects with the aim of improving the security, reliability, service, condition and comfort of the facilities.
- Plan, coordinate and carry out projects relating to the installation of new trains and refurbishment.
- Assist rotocraft stock depots, both providing technical support and helping to implement new projects.
- Manage the work teams that perform maintenance on the rotocraft stock fleet.
- Ensure that the train maintenance and installation procedures and guidelines established are properly adhered to both internally and by external suppliers.
- Serve as the rotocraft stock expert when participating in technical projects led by other departments of the company.
- Interpret information related to incidents or repairs and draw up reports that determine the state of the rotocraft stock fleet. To act on the basis of these reports, suggesting new projects with the aim of improving the state of the fleet.

**Attributes (Attitude/Safety/Environmental):**

- Meticulous in interpreting information of rotocraft stock fleet
- Proactive in managing installation works
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Apply good communication and problem-solving skills

- To have an ability work in a team
- Adhere to safety regulations, quality standard and environmental regulations.
- Good interpersonal skills

**SECTION** : **(C) MANUFACTURING**

**DIVISION** : **(33) REPAIR AND INSTALLATION OF MACHINERY AND EQUIPMENT**

**GROUP** : **(332) INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT**

**MSIC GROUP : 332**
**AREA : INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRICAL)**
**LEVEL : 2**

**RESPONSIBILITIES**
The Electrical Maintenance Technician is responsible to install, maintain, and repair electrical wiring, equipment, and fixtures. Ensure that work is in accordance with relevant codes. May install or service street lights, intercom systems, or electrical control systems.

**Knowledge:**
- Installing and repairing electrical system
- Testing tools and equipment preparation
- Electrical safety and procedures
- Electrical control systems
- Conformance building and safety codes
- Job specifications and local codes
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**
- Assemble, install, test, and maintain electrical or electronic wiring, equipment, appliances, apparatus, and fixtures
- Diagnose malfunctioning systems, apparatus, and components
- Connect wires to circuit breakers, transformers, or other components.
- Inspect electrical systems, equipment, and components
- Advise management on whether continued operation of equipment could be hazardous.
- Test electrical systems and continuity of circuits in electrical wiring, equipment, and fixtures
- Plan layout and installation of electrical wiring, equipment and fixtures
- Prepare sketches or follow blueprints
- Use a variety of tools and equipment
- Repair or replace wiring, equipment, and fixtures

**Attributes (Attitude/Safety/Environmental):**
- Meticulous in inspecting electrical systems, equipment and components
- Adhere to safety regulations, quality standard and environmental regulations.
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Good interpersonal skills
- Apply good communication
- To have an ability work in a team

**MSIC GROUP : 332**
**AREA : INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRICAL)**
**LEVEL : 3**

**RESPONSIBILITIES**
The Electrical Maintenance Supervisor is responsible to supervise installation, maintaining, and repairing electrical wiring, equipment, and fixtures. Ensure that work is in accordance with relevant codes. May install or service street lights, intercom systems, or electrical control systems.

**Knowledge:**
- Installing and repairing electrical system
- Testing tools and equipment preparation
- Electrical safety and procedures
- Electrical control systems
- Conformance building and safety codes
- Job specifications and local codes
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**
- Supervise assembling works, installation, testing, and maintaining electrical or electronic wiring, equipment, appliances, apparatus, and fixtures.
- Supervise diagnosing malfunctioning systems, apparatus, and components
- Supervise connecting wires to circuit breakers, transformers, or other components.
- Supervise inspecting electrical systems, equipment, and components
- Advise management on whether continued operation of equipment could be hazardous.
- Supervise testing electrical systems and continuity of circuits in electrical wiring, equipment, and fixtures
- Supervise plan layout and installation of electrical wiring, equipment and fixtures
- Check sketches or follow blueprints
- Use a variety of tools and equipment such as power construction equipment, measuring devices, power tools, and testing equipment
- Supervise repairing or replacing wiring, equipment, and fixtures

**Attributes (Attitude/Safety/Environmental):**
- Meticulous in supervising electrical systems, equipment and components inspection
- Proactive in supervising subordinate works
- Adhere to safety regulations, quality standard and environmental regulations.
- Use a proper Personal Protective Equipment (PPE) when handling equipment

- Apply good communication
- To have an ability work in a team

**MSIC GROUP : 332**
**AREA : INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRICAL)**
**LEVEL : 4**

**RESPONSIBILITIES**
The Electrical Maintenance Assistant Engineer is responsible to assist in designing electrical systems by developing and testing component. They also responsible to planning and managing electrical operation activities

**Knowledge:**
- Electrical systems, products, components, and applications
- Designing and conducting research programs
- Designing testing methods and testing properties
- Studying customer requirements; researching and testing manufacturing and assembly methods and materials
- Designing and modifying equipment for building and assembling electrical components; soliciting observations from operators
- Designing electrical testing methods; testing finished products and system capabilities.
- Collecting, analysing, and summarising information and trends.
- Complying with federal and state regulations.
- Following manufacturer's instructions and established procedures and requesting repair service.
- Writing computer programs and entering data
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**
- Assist in evaluating electrical systems, products, components, and applications
- Assist in confirmation system's and components' capabilities
- Assist in developing electrical products
- Assist in developing manufacturing processes
- Assures product quality
- Assist in preparing product reports
- Assist in providing engineering information by answering questions and requests.
- Assist in maintaining product and company reputation
- Keeps equipment operational
- Maintains product data base
- Completes projects by training and guiding technicians.
- Maintains professional and technical knowledge
- Contributes to team effort by accomplishing related results as needed.

**Attributes (Attitude/Safety/Environmental):**

- Meticulous in evaluating electrical systems, equipment, components and application
- Proactive in supervising subordinate works
- Creatives in developing electrical products
- Thorough in checking product quality
- Adhere to safety regulations, quality standard and environmental regulations.
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Apply good communication and problem-solving skills
- To have an ability work in a team

**MSIC GROUP : 332**
**AREA : INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRICAL)**
**LEVEL : 5**

**RESPONSIBILITIES**
The Electrical Maintenance Engineer is responsible to design electrical systems by developing and testing component. They also responsible to planning and managing electrical operation activities

**Knowledge:**
- Electrical systems, products, components, and applications
- Designing and conducting research programs
- Designing testing methods and testing properties
- Studying customer requirements; researching and testing manufacturing and assembly methods and materials
- Designing and modifying equipment for building and assembling electrical components; soliciting observations from operators
- Designing electrical testing methods; testing finished products and system capabilities.
- Collecting, analysing, and summarising information and trends.
- Complying with federal and state regulations.
- Following manufacturer's instructions and established procedures and requesting repair service.
- Writing computer programs and entering data
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**
- Evaluates electrical systems, products, components, and applications
- Confirms system's and components' capabilities
- Develops electrical products
- Develops manufacturing processes
- Assures product quality
- Prepares product reports
- Provides engineering information
- Maintains product and company reputation
- Keeps equipment operational
- Maintains product data base
- Completes projects by training and guiding technicians.
- Maintains professional and technical knowledge
- Contributes to team effort by accomplishing related results as needed.

**Attributes (Attitude/Safety/Environmental):**

- Meticulous in evaluating electrical systems, equipment, components and application
- Proactive in supervising subordinate works
- Creatives in developing electrical products
- Thorough in checking product quality
- Adhere to safety regulations, quality standard and environmental regulations.
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Apply good communication and problem-solving skills
- To have an ability work in a team

**MSIC GROUP : 332**
**AREA : INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRONIC)**
**LEVEL : 2**

**RESPONSIBILITIES**
The Electronic Maintenance Technician is responsible to assemble or fabricate electronic parts, pieces or products using a variety of tools and equipment according to required specifications in a specific area of a production line in a manufacturing organization.

**Knowledge:**
- Electronic components, subassemblies, products, or systems
- Bonding procedures and equipment
- Electrical or dimensional characteristics
- Testing and inspection activities
- Testing procedures and guidelines
- Tools and equipment preparation
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**
- Assemble electronic components, subassemblies, products, or systems
- Positions and aligns parts in specified relationship to each other in jig, fixture, or other holding device
- Crimps, stakes, screws, bolts, rivets, welds, solders, cements, press fits, or performs similar operations
- Mounts assembled components
- Connects component lead wires to printed circuit or routes and connects wires between individual component leads and other components, connectors, terminals, and contact points,
- Installs finished assemblies or subassemblies in cases and cabinets
- Assembles and attaches hardware
- Performs intermediate assembly tasks
- Tends machines that press, shape, or wind component parts
- Adjusts or trims materials from components
- Performs on-line go-not-go testing and inspection
- May perform assembly operations under microscope or other magnifying device
- Occupations related to assembly of printed circuit boards and fabrication of integrated circuit chips

**Attributes (Attitude/Safety/Environmental):**

- Meticulous in assembling electronic components
- Meticulous in mount assembled components
- Adhere to safety regulations, quality standard and environmental regulations.
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Good interpersonal skills
- Apply good communication
- To have an ability work in a team

**MSIC GROUP : 332**
**AREA : INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRONIC)**
**LEVEL : 3**

**RESPONSIBILITIES**
The Electronic Maintenance Supervisor is responsible to supervise assembling or fabricating electronic parts, pieces or products using a variety of tools and equipment according to required specifications in a specific area of a production line in a manufacturing organization.

**Knowledge:**
- Electronic components, subassemblies, products, or systems
- Bonding procedures and equipment
- Electrical or dimensional characteristics
- Testing and inspection activities
- Testing procedures and guidelines
- Tools and equipment preparation
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**
- Supervise assembling electronic components, subassemblies, products, or systems
- Supervise positioning and aligning parts
- Supervise crimps, stakes, screws, bolts, rivets, welds, solders, cements, press fits, or performs similar operations to join or secure parts in place, using hand tools, power tools, machines, and equipment
- Supervise mounting assembled components
- Supervise connecting component lead wires to printed circuit or routes and connects wires between individual component leads and other components, connectors, terminals, and contact points
- Supervise installing finished assemblies or subassemblies in cases and cabinets
- Supervise assembling and attaches hardware
- Supervise performing intermediate assembly tasks
- Supervise tends machines that press, shape, or wind component parts
- Supervise adjusting or trimming materials from components to achieve specified electrical or dimensional characteristics
- Supervise performing on-line go-not-go testing and inspection
- Supervise performing assembly operations under microscope or other magnifying device
- Occupations related to assembly of printed circuit boards and fabrication of integrated circuit chips are defined under separate definitions

**Attributes (Attitude/Safety/Environmental):**

- Proactive in supervising subordinate works
- Meticulous in supervising assembly works
- Adhere to safety regulations, quality standard and environmental regulations.
- Use a proper Personal Protective Equipment (PPE) when handling equipment
- Good interpersonal skills
- Apply good communication
- To have an ability work in a team

**MSIC GROUP : 332**
**AREA : INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRONIC)**
**LEVEL : 4**

**RESPONSIBILITIES**

The Electronic Maintenance Assistant Engineer is responsible to assist in research, design, develop, and test electronic components and systems for commercial, industrial, military, or scientific use utilising knowledge of electronic theory and materials properties. Design electronic circuits and components for use in fields such as telecommunications, aerospace guidance and propulsion control, acoustics, or instruments and controls.

**Knowledge:**

- Budget and cost estimates
- Designing electronic components and software, product and systems
- Equipment standards and technical engineering support
- Instruction and engineering task
- Computer-assisted engineering and design software and equipment
- Feasibility of project and develop system plan
- Communication and problem-solving skills
- Effectiveness, technical adequacy and compatibility in the resolution of complex engineering problems.
- Conformance to specifications, safety standards, and applicable codes and regulations
- Confidential descriptions and specifications of proprietary hardware and software, product development and introduction schedules, product costs, and information about product performance weaknesses
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**

- Assist in reviewing or preparing budget and cost estimates
- Assist in designing electronic components and software, products and systems
- Assist in providing technical support and instruction to staff and customers
- Assist in operating computer-assisted engineering and design software and equipment
- Assist in analysing system requirements, capacity, cost, and customer needs
- Liaise with other relevant department
- Assist in reviewing and evaluating work of others, inside and outside the organization
- Determine material and equipment needs and order supplies.
- Assist in inspecting electronic equipment, instruments, products, and systems
- Assist in evaluating operational systems, prototypes and proposals and recommend repair or design modifications

- Assist in preparing documentation containing information
- Assist in planning and developing applications and modifications for electronic properties
- Assist in preparing engineering sketches and specifications for construction, relocation, and installation of equipment, facilities, products, and systems.
- Assist in preparing, reviewing, and maintaining maintenance schedules, designing documentation and operational reports and charts.

**Attributes (Attitude/Safety/Environmental):**

- Good communication and problem-solving with subordinates
- Adhere to safety regulations, production quality standard and environmental regulations.
- Good interpersonal skills
- High level of commitment and strong team player
- Ability to supervision skills
- Good in using computer skills and software
- Meticulous in preparing budget and cost estimates

**MSIC GROUP : 332**
**AREA : INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (ELECTRONIC)**
**LEVEL : 5**

**RESPONSIBILITIES**

The Electronic Maintenance Engineer is responsible to research, design, develop, and test electronic components and systems for commercial, industrial, military, or scientific use utilising knowledge of electronic theory and materials properties. Design electronic circuits and components for use in fields such as telecommunications, aerospace guidance and propulsion control, acoustics, or instruments and controls.

**Knowledge:**

- Budget and cost estimates
- Designing electronic components and software, product and systems
- Equipment standards and technical engineering support
- Instruction and engineering task
- Computer-assisted engineering and design software and equipment
- Feasibility of project and develop system plan
- Communication and problem-solving skills
- Effectiveness, technical adequacy and compatibility in the resolution of complex engineering problems.
- Conformance to specifications, safety standards, and applicable codes and regulations
- Confidential descriptions and specifications of proprietary hardware and software, product development and introduction schedules, product costs, and information about product performance weaknesses
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**

- Review or prepare budget and cost estimates
- Represent employer at conferences, meetings, boards, panels, committees, and working groups
- Design electronic components and software, products and systems
- Provide technical support and instruction to staff and customers
- Operate computer-assisted engineering and design software and equipment
- Analyse system requirements, capacity, cost, and customer needs
- Confer with engineers, customers, vendors and others
- Review and evaluate work of others, inside and outside the organization
- Determine material and equipment needs and order supplies.
- Inspect electronic equipment, instruments, products, and systems

- Evaluate operational systems, prototypes and proposals and recommend repair or design modifications
- Prepare documentation containing information
- Direct and coordinate activities concerned with manufacture, construction, installation, maintenance, operation, and modification of electronic equipment, products, and systems.
- Plan and develop applications and modifications for electronic properties
- Prepare engineering sketches and specifications for construction, relocation, and installation of equipment, facilities, products, and systems.
- Plan and implement research, methodology, and procedures
- Prepare, review, and maintain maintenance schedules, design documentation and operational reports and charts.

**Attributes (Attitude/Safety/Environmental):**

- Good communication and problem-solving with subordinates
- Adhere to safety regulations, production quality standard and environmental regulations.
- Good interpersonal skills
- High level of commitment and strong team player
- Ability to supervision skills
- Good in using computer skills and software
- Meticulous in preparing budget and cost estimates

**MSIC GROUP : 332**
**AREA : INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHANICAL)**
**LEVEL : 2**

**RESPONSIBILITIES**
The Mechanical Maintenance Technician is responsible to assemble or fabricate mechanical parts, pieces or products using a variety of tools and equipment according to required specifications in a specific area of a production line in a manufacturing organisation.

**Knowledge:**
- Engineering equipment and product assembly
- Function of hand tools
- Soldering process procedures
- Quality inspection
- Preparing documentation and compilation report
- Interpreting the engineering specification
- Quality standards and safety procedures
- Housekeeping practices
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**
- Read, interpret and follow basic blueprints, diagrams, engineering drawings, specifications, bills of materials, and other written instructions or procedures
- Utilise hand held tools such as a hand-held screw and drill gun
- Performing soldering, which is the process in which two or more metal items are joined together
- Maintain inventory of product in work stations
- Perform quality work checks
- Identify product defects and complete appropriate documentation
- Rework and/or repair assembled equipment and products
- Perform all work in accordance with quality standards and established safety procedures
- Maintain a clean and safe work area

**Attributes (Attitude/Safety/Environmental):**
- Good communication
- Adhere to safety regulations, production quality standard and environmental regulations.
- Good interpersonal skills

- Good in using computer skills and software
- Details in checking quality work
- Proactive when maintain clean and safe work area

**MSIC GROUP : 332**
**AREA : INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHANICAL)**
**LEVEL : 3**

**RESPONSIBILITIES**
The Mechanical Maintenance Supervisor is responsible to supervise and monitor assembling or fabricating mechanical parts, pieces or products using a variety of tools and equipment according to required specifications in a specific area of a production line in a manufacturing organisation.

**Knowledge:**
- Engineering equipment and product assembly
- Soldering process procedures
- Quality inspection
- Preparing documentation and compilation report
- Interpreting the engineering specification
- Quality standards and safety procedures
- Housekeeping practices
- Supervisory skills
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**
- Read, interpret and follow basic blueprints, diagrams, engineering drawings, specifications, bills of materials, and other written instructions or procedures
- Utilise hand held tools
- Supervise performing soldering, which is the process in which two or more metal items are joined together
- Monitor inventory of product in work stations
- Monitor quality work checks
- Check and verify product defects and complete appropriate documentation when defects are identified
- Supervise rework and/or repair assembled equipment and products according
- Perform all work in accordance with quality standards and established safety procedures
- Monitor a clean and safe work area

**Attributes (Attitude/Safety/Environmental):**
- Good communication
- Adhere to safety regulations, production quality standard and environmental regulations.
- Good interpersonal skills

- Good in using computer skills and software
- Details in checking quality work
- Proactive when supervising subordinate works

**MSIC GROUP : 332**
**AREA : INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHANICAL)**
**LEVEL : 4**

**RESPONSIBILITIES**
The Mechanical Maintenance Assistant Engineer is responsible to assist in designing and planning mechanical and electromechanical products and systems by developing and testing specifications and methods

**Knowledge:**
- Designing and conducting research programs
- Applying principles of mechanics, thermodynamics, hydraulics, heat transfer, and materials
- Studying customer requirements
- Researching and testing manufacturing
- Assembly methods and materials
- Soliciting observations from operators
- Designing testing methods
- Collecting, analysing, and summarising information and trends.
- Complying with government regulations
- Coordinating maintenance and repair services
- Following manufacturer's instructions and established procedures
- Requesting special services.
- Writing computer programs and entering data
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**
- Assist in evaluating mechanical and electromechanical systems and products
- Assist in developing mechanical and electromechanical products
- Assist in developing manufacturing processes
- Assist in assuring system and product quality by designing testing methods; testing finished-product and system capabilities; confirming fabrication, assembly, and installation processes.
- Assist in preparing product reports
- Assist in providing engineering information
- Maintains product and company reputation
- Keeps equipment operational
- Maintains system and product data base
- Contributes to team effort

**Attributes (Attitude/Safety/Environmental):**

- Good communication and problem-solving skills
- Adhere to safety regulations, production quality standard and environmental regulations.
- Good interpersonal skills
- Proactive when supervising subordinate works

**MSIC GROUP : 332**
**AREA : INSTALLATION OF INDUSTRIAL MACHINERY AND EQUIPMENT (MECHANICAL)**
**LEVEL : 5**

**RESPONSIBILITIES**
The Mechanical Maintenance Engineer is responsible to design and planning mechanical and electromechanical products and systems by developing and testing specifications and methods

**Knowledge:**
- Designing and conducting research programs
- Applying principles of mechanics, thermodynamics, hydraulics, heat transfer, and materials
- Studying customer requirements
- Researching and testing manufacturing
- Assembly methods and materials
- Soliciting observations from operators
- Designing testing methods
- Collecting, analysing, and summarising information and trends.
- Complying with government regulations
- Coordinating maintenance and repair services
- Following manufacturer's instructions and established procedures
- Requesting special services.
- Writing computer programs and entering data
- Instructions and working procedure
- Company safety, rules & regulations

**Skills:**
- Evaluates mechanical and electromechanical systems and products
- Confirms system and product capabilities
- Develops mechanical and electromechanical products
- Develops manufacturing processes
- Assures system and product quality
- Prepares product reports
- Provides engineering information
- Maintains product and company reputation
- Keeps equipment operational
- Maintains system and product data base
- Maintains professional and technical knowledge
- Contributes to team effort

**Attributes (Attitude/Safety/Environmental):**

- Good communication and problem-solving skills
- Adhere to safety regulations, production quality standard and environmental regulations.
- Good interpersonal skills
- Proactive when supervising subordinate works