



OCCUPATIONAL FRAMEWORK
SECTION F: CONSTRUCTION
DIVISION 42: CIVIL ENGINEERING

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Ministry of Human Resources

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ABSTRACT

Occupational Framework (OF) is based on the Malaysian Standard Industrial Classification 2008 (MSIC 2008) are consider the sections, division, and groups for determining the title of OF that covers the industry field. The development of OF in civil engineering has never been developed. This study proposes the OF, Job Titles (JT), Occupational Descriptions (OD), Competencies in Demand (CiD), and Critical Skills Requirements (CSR) in the civil engineering. Specifically, this study seeks to (1) list the critical jobs in civil engineering industry, (2) establish the OD for each JT based on the latest industry OF, (3) determine the CiD in civil engineering industry; and (5) identify JT relevant to IR4.0 and green technology in civil engineering industry. An analysis document, Focus Group Discussion (FGD), and questionnaire are used as research tools for data collection. Evaluation of work of not only from other researchers, but also from professional through trade reports, the websites, and articles are utilized for document analysis data collection. A total number of thirteen expert panels from industries are chosen purposively for the FGD conducted in four series. While 270 respondents are selected using a stratified random sampling technique from a population of 21,385 based on the Krejcie and Morgan sampling table. The data collection procedures are implemented in seven phases. In this study, the utilization of multiple method or data source develops a comprehensive finding of the phenomena triangulated from the research approached employed in the study. Findings indicated that the proposed OF Division 42 for civil engineering is similar to existing MOSQF with the category of Level 1 – 8. The importance of training center to strengthen the Regulatory Bodies relevance with government agencies are crucial to identify CiD. Hence, training centers are one important component to certify JT in certain levels. The study contributes towards the development of OF for Civil Engineering by giving priority to emerging technologies, translated in the production of the new OF.

ABSTRAK

Kerangka Pekerjaan (OF) berdasarkan Klasifikasi Industri Standard Malaysia 2008 (MSIC 2008) mempertimbangkan seksyen, bahagian dan kumpulan untuk menentukan tajuk OF yang merangkumi bidang industri. Perkembangan OF dalam bidang kejuruteraan awam tidak pernah dibangunkan. Kajian ini mencadangkan OF, Judul Pekerjaan (JT), Deskripsi Pekerjaan (OD), Kompetensi dalam Permintaan (CiD), dan Keperluan Kemahiran Kritikal (CSR) dalam kejuruteraan awam. Secara khusus, kajian ini bertujuan untuk (1) menyenaraikan pekerjaan penting dalam industri kejuruteraan awam, (2) menetapkan OD untuk setiap JT berdasarkan industri terbaru OF, (3) menentukan CiD dalam industri kejuruteraan awam; dan (5) mengenal pasti JT yang relevan dengan IR4.0 dan teknologi hijau dalam industri kejuruteraan awam. Dokumen analisis, Perbincangan Kumpulan Fokus (FGD), dan soal selidik digunakan sebagai instrumen untuk pengumpulan data. Kajian ini tidak tertumpu kepada hasil analisa penyelidik sahaja, tetapi juga melalui hasil analisa professional melalui laporan dokumen rasmi, dan laman web. Seramai tiga belas panel pakar dari industri dipilih untuk FGD yang dijalankan dalam empat siri. Manakala 270 responden dipilih menggunakan teknik pensampelan rawak berstrata dari populasi 21,385 berdasarkan jadual persampelan Krejcie dan Morgan. Prosedur pengumpulan data dilaksanakan dalam tujuh fasa. Dalam kajian ini, penggunaan pelbagai kaedah atau sumber data mengembangkan penemuan yang komprehensif mengenai fenomena yang disusun dari kajian yang digunakan dalam kajian ini. Hasil kajian menunjukkan bahawa cadangan Bahagian 42 untuk kejuruteraan awam adalah serupa dengan MOSQF yang ada dengan kategori Tahap 1 - 8. Kepentingan pusat latihan untuk memperkukuhkan hubungan *Regulatory Bodies* dengan agensi kerajaan sangat penting untuk mengenal pasti CiD. Oleh itu, pusat latihan merupakan salah satu komponen penting untuk menentukan JT pada tahap tertentu. Kajian ini menyumbang ke arah pengembangan OF untuk Kejuruteraan Awam dengan mengutamakan teknologi baru, yang diterjemahkan dalam pengeluaran OF baru.

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LIST OF ABBREVIATIONS

ABM	-	<i>Akademi Binaan Malaysia</i>
ACEM	-	The Association of Consulting Engineers Malaysia
ADE	-	Automation & Digitalization Facility
AES	-	All-Economic Sector Facility
AF	-	Agrofood Facility
APAD	-	The Land Public Transport Agency
APEL	-	Accreditation of Prior Experiential Learning
API	-	American Petroleum Institute
ARRP	-	Accelerated Rural Road Program
BEM	-	The Board of Engineers Malaysia
BGP	-	Federal Commonwealth Buildings
BRF	-	Bumiputera Relief Financing
BSC	-	Balance Scoreboard
BWRA	-	British Welding Research Association
CBT	-	Competency Based Training
CiD	-	Competencies in Demand
CIDB	-	Construction Industry Development Board
CITP	-	Construction Industry Transformation Program
Covid-19	-	Coronavirus Disease 19
CREAM	-	Construction Research Institute of Malaysia
CReaTE	-	<i>Pusat Kecemerlangan Kejuruteraan dan Teknologi Jabatan Kerja Raya</i>
CSR	-	Critical Skills Requirements
DKLM	-	<i>Diploma Lanjutan Kemahiran Malaysia</i>
DKM	-	<i>Diploma Kemahiran Malaysia</i>
DoE	-	Department of Environment
DoSH	-	Department of Occupational Safety and Health
DoSM	-	Department of Statistics Malaysia
DSD	-	Department of Skills Development
ESP	-	Economic Stimulus Package
FMSR	-	Federated Malay States Railway
GDP	-	Gross Domestic Product
HR	-	Human Resources
IBS	-	Industrialized Building System
ICP	-	Individual Certification Program
IEM	-	Institute of Engineers Malaysia
IKBN	-	<i>Institut Kemahiran Belia Negara</i>

ILP	- Industrial Training Institute
IMP3	- Third Industrial Master Plan
IoT	- Internet of Things
IR4.0	- Industrial Revolution 4.0
ISIC	- International Standard Industrial Classification of All Economic Activities
JALB	- The Rural Road Program
JKT	- Department of Local Government
JMG	- Department of Mineral and Geoscience Malaysia
JPJ	- Road Transport Department
JPP	- The Sewerage Services Department
JPS	- <i>Jabatan Pengairan dan Saliran</i>
JPSM	- Jabatan Perhutanan Semenanjung Malaysia
JT	- Job Title
KeKKWa	- Heritage Division under the Ministry of Tourism, Arts and Culture Malaysia
KKR	- The Work Ministry
KPLB	- <i>Kementerian Pembangunan Luar Bandar</i>
KTMB	- <i>Keretapi Tanah Melayu Berhad</i>
LFPR	- Labour Force Participation Rate
LLM	- <i>Lembaga Lebuhraya Malaysia</i>
MBOT	- Malaysia Board of Technologists
MCO	- Movement Control Order
MESTECC	- Ministry of Energy, Science, Technology, Environment and Climate Change
MIROS	- Malaysian Institute of Road Safety Research
MIROS	- Malaysian Institute of Road Safety
MITI	- Ministry of International Trade and Industry
MOA	- Ministry of Agriculture & Agro-Based Industry
MOSQF	- The Malaysian Occupational Skills Qualification Framework
MOT	- Ministry of Transport
MoW	- The Ministry of Works
MQF	- Malaysian Qualification Framework
MRA	- Malayan Railway Administration
MSC	- Malaysian Skills Certificate
MSCS	- Malaysian Skills Certification System
MSIC2008	- Malaysian Standard Industrial Classification 2008
NCS	- National Competency Standard
NGDS	- National Gas Distribution System
NIOSH	- National Institute of Occupational Safety and Health

NOSS	- National Occupational Skills Standard
NRE	- Ministry of Natural Resource & Environment
OA	- Occupational Analysis
OD	- Occupational Descriptions
OF	- Occupational Framework
OS	- Occupational Structure
OSd	- Occupational Standard
OSH	- Occupational Safety and Health
PAAB	- <i>Pengurusan Aset Air Berhad</i>
PBT	- Local Authorities
PDRM	- Royal Malaysian Police
PEMULIH	- People's Protection and Economic Recovery Package
PSU	- Wage Subsidy Program
PWD	- Public Work Department
RAC	- Department of Railways, Railway Assets Corporation
REAM	- Road Engineering Association of Malaysia
RMK11	- <i>Rancangan Malaysia Ke-11</i>
RSD	- Road Safety Department
SICW	- Safety and Health Induction Course for Construction Workers
SIRIM	- Standard and Industrial Research Institute of Malaysia
SKM	- <i>Sijil Kemahiran Malaysia</i>
SMART	- Stormwater Management and Road Tunnel
SOCISO	- Social Security Organization
SOP	- Standard Operating Procedures
SPAN	- Water Service Commission
SRF	- Special Relief Facility
TN50	- Transformation Plan 2050
TNB	- <i>Tenaga Nasional Berhad</i>
TTA	- Tunneling Training Agency
TUCN	- Technical University Colleges Network
TVET	- Technical Vocational Education and Training
UBBL	- Uniform Building by Law
UiTM	- Universiti Teknologi MARA
UNSD	- United Nations Statistics Division
UTM	- Universiti Teknologi Malaysia
HD	- High in Demand
MD	- Mid in Demand
LD	- Low in Demand

- ND - Not in Demand
- SA - Strongly Agree
- A - Agree
- D - Disagree
- SD - Strongly Disagree

GLOSSARY

Job titles	A job title is the name of the position you hold at your company, typically associated with a specific set of tasks and responsibilities. A job title often denotes a person's level of seniority within a company or department. It also gives insight into what an employee contributes to a company (TalentCorp, 2020). In the context of this study the job title to be identified is based on the Critical Occupational report together with the occupational framework developer panel in the field of civil engineering.
Occupational Structure	This refers to the aggregate distribution of occupations in society, classified according to skill level, economic function, or social status. The occupational structure is shaped by various factors: the structure of the economy; the relative weight of different industries (John Scott, 2015). In this study the OS will be developed together with an expert panel of occupational framework developers to list the job structure in the field of civil engineering.
Competencies in Demand	Field (2009) said the debate on competencies has been focused on the demands of three stakeholders including "... employers that state that they are looking to hire people with a certain set of competencies; job seekers promote their competencies in resumes and job interviews and library schools promote that their graduates have the needed 21st century competencies that are valued by the work place". As Field noted, employers are looking forward to hiring competent people with a definite set of knowledge and skills. In the context of this study Competencies in Demand (CiD) is the competencies required by each JT and occupational structure (OS) that have been developed together with the focus group discussion panel.
Critical job	The Critical Job (CJ) is a set of occupations in demand that identifies the skills imbalance across 18 economic sectors in Malaysia. It aims to be the primary instrument to promote better coordination of human capital

policies aimed at attracting, nurturing and retaining talent (TalentCorp, 2020). Collated on an annual basis by the Critical Skills Monitoring Committee (CSC), led by TalentCorp and the Institute of Labour Market Information and Analysis (ILMIA) under the Ministry of Human Resources (MOHR), the CJ was developed based on recommended international practices. Its compilation process is based on regular consultations with the World Bank. In the context of this study CJ was developed through focus group discussion for the field of civil engineering.

Civil Engineering

Civil engineering is a professional engineering discipline that deals with the design, construction, and maintenance of the physical and naturally built environment, including public works such as roads, bridges, canals, dams, airports, sewage systems, pipelines, structural components of buildings, and railways (J. Garth Watson, 1967). In this study, the field of civil engineering that is focused in three group namely, Construction of Roads and Railways, Construction of Utility Projects and Construction of Other Civil Engineering Projects.

Industrial Revolution 4.0

The Fourth Industrial Revolution (4IR or Industry 4.0) is the ongoing automation of traditional manufacturing and industrial practices, using modern smart technology. The term Industrial Revolution 4.0 (IR 4.0), Industry 4.0 or Industrie 4.0 has been introduced by the German federal government in 2011 as one of the key initiatives of its high-tech strategy that has been proposed as a new, emerging structure and integrated communications network for a widely automated exchange of information between production and processes (Bahrin et al, 2016). IR 4.0 combines the strengths of traditional industries with cutting edge internet technologies as the embedding of smart products into digital and physical processes that interact with each other through geographical and organizational borders (Schmidt, 2015). In this study IR 4.0 is used as a guide in developing OS and CiD in OF to be developed.

Green
Technology

Green technology is an environmentally friendly technology that prevents pollution that harms human health and living organisms. This technology provides energy sources and alternative resources to sources and resources that cause damage to the environment (Mohamed Noori, 2018). In this study Green Technology is used as a guide in developing OS and CiD in OF to be developed.

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter presents the research background, statement of the problem and purpose, research objectives and research questions, scope of the study, limitations of the study, and structure of the chapter.

1.2 Research Background

Section F on Construction is divided into three categories in the Malaysian Standard Industrial Classification 2008 (MSIC 2008): building construction (Division 41), civil engineering (Division 42), and specialised construction activities (Division 43). This Occupational Framework (OF) is mainly concerned with two digits. Division 42 of the MSIC 2008: Civil Engineering objects are included in this division. It includes new construction, repairs, additions, alterations, and on-site installation of prefabricated structures and temporary construction. One of Malaysia's most important industries is construction. Heavy constructions such as highways, streets, bridges, tunnels, trains, airfields, harbours, other water projects, irrigation systems, sewerage systems, industrial facilities, pipelines and electric lines, and outdoor recreation facilities are classified as heavy constructions by MSIC.

Malaysia's Gross Domestic Product (GDP) increased 16.1% in the second quarter of 2021, following four consecutive quarters of contraction. However, this quarter's strong growth was also attributed to the low base recorded in the second quarter of 2020. GDP contracted 2.0% quarter on quarter seasonally adjusted, down from 2.70% in the previous quarter. The level of economic value in this quarter remained lower than the pre-pandemic level of the fourth quarter of 2019. On the other hand, the Department of Statistics Malaysia (DoSM) (2021) claimed that the construction sector expanded 40.3 per cent from a decrease of 10.4 per cent in the previous quarter. The performance was backed by specialised construction activities and civil engineering, which recorded 58.1 per cent and 50.0 per cent, respectively. Furthermore, the Non-residential buildings (34.8%) and Residential buildings (16.3%) sub-sectors also

improved this quarter. Nevertheless, the construction sector declined 8.8 per cent on a quarter-on-quarter basis.

This chapter will describe the problem statement, objectives, and scope of the study in order to provide additional context for the research into this business, as well as the rationale for using MSIC 2008 Section F, Division 42 to classify civil engineering works that are performed on their own or on a fee or contract basis. Parts of the work, and sometimes the entire practical work, can be subcontracted out.

1.3 Problem Statement

The comprehensive job structure includes job fields and job titles according to Malaysia's industry-level based on the economic activity classification of the MSIC 2008 registered by the DoSM used from 2017. Previously, the field classification reference was based on 29 industry sectors from the Third Industrial Master Plan (IMP3), Ministry of International Trade and Industry (MITI). As a result, the Occupational Framework (OF) is developed based on MSIC 2008, considering the sections and sections for determining the title of OF that covers the field of the industry. For civil engineering, the development of OF has never occurred. Standard and curricular studies for the Technical Vocational Education and Training (TVET) ecosystem by prioritising emerging technologies are translated with new OF to be developed in the study.

1.4 Research Objectives

The objectives of this study are to propose the OF that includes Job Titles (JT), Occupational Structure (OS), and Competencies in Demand (CiD) in civil engineering. The objectives of the study are as follows:

1. To develop the OS for MSIC 2008, Section F Division 42: Civil Engineering.
2. To list the critical jobs in the civil engineering industry.
3. To develop the OD for each JT based on the latest industry OF.
4. To determine the CiD in the civil engineering industry; and
5. To identify JT relevant to IR4.0 and green technology in the civil engineering industry.

1.5 Research Questions

The study aims to seek answers to the following research questions:

1. How is the OS for MSIC 2008, Section F Division 42; Civil Engineering developed?
2. What are the critical jobs in the civil engineering industry?

3. How does the OD for each JT based on the latest industry OF is developed?
4. What are the CiD in the civil engineering industry?
5. What are the JT relevant to IR4.0 and green technology in civil engineering study?

1.6 Scope of the Study

The scope of work of this study is the civil engineering sector in Malaysia as classified in Section F Division 42 as outlined in MSIC 2008. It covers new construction, repairs, extensions, and renovations, as well as the assembly of prefabricated structures on the site and temporary construction. Heavy construction projects include highways, streets, bridges, tunnels, trains, airfields, harbours, and other water projects, as well as irrigation systems, sewerage systems, industrial facilities, pipelines and electric lines, and outdoor recreation facilities, among others. Construction of buildings (Division 41) is excluded, such as full residences, office buildings, stores, and other public, utility, and farm structures. Construction activities classified as specialised construction (Division 43), such as foundation work, scaffolding, and building completion, are also excluded.

1.7 Limitation of the Study

Both qualitative and quantitative approaches will be used through document analysis, Focus Group Discussions (FGD), and a survey. The scope of this study includes Peninsular Malaysia, Sabah, Sarawak, and Labuan. Respondents to this survey must be employed in the construction industry and registered with the Malaysian Construction Industry Development Board (CIDB) under the Civil Engineering (CE) registration Category. The total respondent calculation technique is taken from Krejcie and Morgan (1970) as a sample size of this research.

1.8 Structure of Chapter

This chapter concludes with a brief overview of the entire study which includes (1) Chapter 1 - This chapter introduces the research consisting of an introduction to the construction industry, the problem statement, objectives and scope of the study as well as justification for selecting 2 digits MSIC 2008, Division 42: Construction of Civil Engineering as the basis for classification 4, (2) Chapter 2 - This chapter provides a literature review about the research which gives a further understanding about the industry sourcing from the Construction Industry Development Board (CIDB), DoSM and from other local and international related sources, (3) Chapter 3 - This chapter describes the overall approach and methods deployed to achieve the objectives of the study, such as FGD with experts from the civil engineering construction, surveys from

companies related to the industry and document analysis based on published information, (4) Chapter 4 - This chapter organises all the results and findings of the research on civil engineering construction obtained based on the objectives of the study, and (5) Chapter 5 - This chapter summarises the results and conclusions of the study as well as proposes recommendations to address the skills demand, develop skilled personnel and certify Malaysians in this industry.

1.9 Conclusion

This chapter provides the premise for the study and discusses background pertaining to MSIC 2008 and the information of the implementation during the Covid-19 pandemic in Malaysia. These are followed by the crucial elements of job demands and supply industry leads to the objectives, research questions, scope, limitation, and significance of the study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter examines the current state of the Malaysian civil engineering construction sector, as well as related government entities and professional organizations, relevant legislation and acts, government strategies and development goals, and the industry's international competitiveness.

The information in this chapter is gathered through literature research, observation, and discussions with members of the development panel during FGD. This literature review is then addressed with panel members in order to gain a practitioner's perspective on the issues at hand.

2.2 Malaysia Skills Certification System

In Malaysia, the achievement through assessment and training of skill and work-based is certified under the Malaysian Skills Certification System (MSCS). Candidates can obtain the Malaysian Skills award if they meet the requirements of the National Occupational Skills Standard (NOSS) developed and regulated by the Department of Skills Development (DSD) (formerly known as the National Vocational Training Council).

It is conferred as a formally recognized certificate to individuals who have shown capabilities that acquired or practised with competencies to do a task or work, usually in basic vocational skills. The criteria and standards of the MSCS are articulated with higher-level qualifications to enable holders to progress from the level of semi skills to skilled production, right up to supervisory, executive and managerial functions.

There are currently five levels of awards in the MSCS or *Sijil Kemahiran Malaysia* (SKM), *Diploma Kemahiran Malaysia* (DKM), and *Diploma Lanjutan Kemahiran Malaysia* (DLKM):

i. Level 1: MSCS 1 (*SKM 1*)

Awarded to candidates who show competence in performing a range of various job tasks or work activities, most of which are routine and predictable.

ii. Level 2: MSCS 2 (*SKM 2*)

It was awarded to candidates who show competence in performing a significant range of varied work activities that are being performed in various contexts. Some of these activities are non-routine, requiring individual responsibility and autonomy.

iii. Level 3: MSCS 3 (*SKM 3*)

Awarded to candidates who show competence in performing a broad range of varied work activities that are performed in various contexts, most of which are complex and non-routine. There is considerable responsibility and autonomy, and control or guidance of others is often required.

iv. Level 4: Malaysian Skills Diploma (*DKM*)

It was awarded to candidates who show competence in performing a broad range of complex technical or professional work activities performed in a wide variety of contexts and with a substantial degree of personal responsibility and autonomy. Responsibility for the work of others and the allocation of resources is often present. A higher level of technical skills should be demonstrated.

v. Level 5: Malaysian Skills Advanced Diploma (*DLKM*)

They are awarded to candidates who show evidence of a level of competence to apply a significant range of fundamental principles and complex techniques across a wide and often unpredictable variety of contexts. Very substantial personal autonomy and often significant responsibility for the work of others and the allocation of substantial resources feature strongly, as do personal accountabilities for analysis, diagnosis, design, planning, execution and evaluation. Specialization in technical skills should be demonstrated.

The National Skills Development Act 2006 is developed to promote, through skills training, the development and improvement of a person's abilities, which are needed for vocation, and to provide for other matters connected in addition to that.

2.2.1 National Skills Development Act 2006 (Act 652)

After being officially gazetted on June 29, 2006, the National Skills Development Act 2006 (Act 652) took effect on September 1, 2006, with the mandate of promoting, through skills training, the development and improvement of a person's abilities that are needed for the vocation, and to provide for other matters related to it. Act 652 is noteworthy because it is the first time in Malaysia's history that national legislation dedicated purely to skills training and development has been adopted. Furthermore, the definition and scope of skills training have been clarified, as well as a legislative interpretation that can be utilized to separate it from other

aspects of the country's national education and training system. Act 652 also establishes a MSCS, which leads to the awarding of five (5) levels of national skills qualifications: Malaysian Skills Certificate (MSC) Levels 1, 2, and 3, Malaysian Skills Diploma, and Malaysian Skills Advanced Diploma.

2.2.2 Malaysian Qualification Framework (MQF)

The MQF is a policy framework that meets the requirements of both nationally and internationally recognized qualifications. It includes titles and standards as well as principles and protocols for articulating and issuing qualifications and assertions of attainment. Qualifying framework elements show the accomplishments for each qualification title. It will also create pathways for all graduates in the relevant occupational domains to advance. As illustrated in Table 2.1, the MQF 2nd Edition has eight levels of qualification in two sectors, each supported by lifelong education pathways. The skills sector is governed by the DSD, which has five levels of qualification. The Malaysian Occupational Skills Qualification Framework (MOSQF) specifies the definitions for each level of skills qualification, which may be found in Annex 1.

Table 2.1: Malaysian Qualification Framework Chart

(Source: (Malaysian Qualifications Agency, 2017))

MQF Level	Minimum Graduating Credit	Academic Sector	TVET Sector	Lifelong Learning/ Accreditation of Prior Experiential Learning (APEL) Criteria for APEL (A)
8	No credit rating	PhD by Research		Admission criteria: 35 years old Bachelor's degree in the relevant field/equivalent 5 years' work experience Passed APEL assessment
	80	Doctoral Degree by Mixed Mode & Coursework		
7	No credit rating	Master's by Research		Admission criteria: 30 years old

MQF Level	Minimum Graduating Credit	Academic Sector	TVET Sector	Lifelong Learning/ Accreditation of Prior Experiential Learning (APEL) Criteria for APEL (A)
	40	Master's by Mixed Mode & Coursework		STPM/Diploma/equivalent Relevant work experience Passed APEL assessment
	30	Postgraduate Diploma		
	20	Postgraduate Certificate		
6	120	Bachelor's degree		Admission criteria: 21 years old Relevant work experience Passed APEL assessment
	66	Graduate Diploma		
	36	Graduate Certificate		
5	40	Advanced Diploma	Advanced Diploma	
4	90	Diploma	Diploma	Admission criteria: 20 years old Relevant work experience Passed APEL assessment
3	60	Certificate	Certificate	Admission criteria: 19 years old Relevant work experience Passed APEL assessment
2	30	Certificate	Certificate	3R
1	15	Certificate	Certificate	3R

2.2.3 Occupational Framework (OF)

An OF is the result of an occupational analysis procedure that identifies an industry's Occupational Structure (OS). OS, OD, and CiD make up the OF, which was initially known as Occupational Analysis (OA) and CiD. The creation of the OF is a step in the process of creating useful NOSS. The NOSS, once completed, can be utilized to provide skills training and certification for competent individuals.

2.2.4 National Occupational Skills Standard (NOSS) and National Competency Standard (NCS)

The NOSS is a document that describes the minimal competencies expected of a skilled worker in Malaysia for a particular area and degree of employment. Part IV of the National Skills Development Act 652, which is a gazette, also defines the process of achieving the competencies.

NOSS was created by industry experts to meet the demands of the industry and is the primary tool for implementing the MSCS. The performance of existing sector workers and trainees is evaluated using the corresponding NOSS for the issuance of MSC under this system. Meanwhile, the NCS specifies the knowledge, abilities, and attitudes required to function in a certain occupation that is unrelated to any specific job categorization.

2.2.5 Competency-Based Training (CBT)

CBT is a method of vocational education that focuses on what a person can do in the workplace as a result of their education and training. CBT is based on industry-set performance criteria, with the primary focus on assessing performance while considering knowledge and attitude rather than the length of time it takes to complete the course. CBT is a learner-centred, outcome-based method of training that allows people to build abilities at their own rate while still achieving a similar result. As a result, training procedures can be tailored to each individual in order to obtain a similar result. The MSCS, which is supervised by DSD, is based on the CBT idea.

2.3 Malaysia Standard Industrial Classification 2008 (MSIC 2008)

The MSIC 2008 is a classification system for productive economic activities that are meant to be universal. Its primary goal is to provide a set of activity categories that can be used to gather and report information based on those activities. As a result, MSIC2008 attempts to offer this set of activity categories in a form that allows organizations to be categorized based on the

economic activity that they engage in. The MSIC 2008 Version 1.0 closely follows the International Standard Industrial Classification of All Economic Activities (ISIC) Revision 4 released by the United Nations Statistics Division (UNSD) for international comparability, with certain adjustments to meet national requirements. An industrial classification system's goal is to organize data about the economy into categories of activities with similar characteristics. The MSIC 2008 is neither a classification of commodities and services nor is it a classification of vocations. It is a classification of all forms of economic activity.

2.4 Scope of Occupational Framework Based on MSIC 2008

The scope of MSIC 2008 on civil engineering construction is covered in this section. This section explains what MSIC 2008 is and how to choose a title. Table 2.2 shows the summary of MSIC 2008 for Section F and Division 42 to identify the scope of coverage for the OF.

Table 2.2: MSIC 2008 by Section, Division and Group

(Source: MSIC 2008)

Section	F	Construction
Division	42	Civil Engineering
Group	421	Construction of Roads and Railways
	422	Construction of Utility Projects
	429	Construction of Other Civil Engineering Projects

Table 2.3, Table 2.4 and Table 2.5 below is also an excerpt taken from MSIC 2008 to illustrate the scope of this OF by groups.

Table 2.3: Description, Class and Item of MSIC 2008 Section F, Division 42, Group 421 Construction of Roads and Railways

(Source: MSIC 2008)

Item	Description	Includes	Excludes
42101	Construction of motorways, streets, roads, other vehicular and pedestrian ways		a. Installation of street lighting and electrical signals

42102	Surface work on streets, roads, highways, bridges, or tunnels	asphalt paving of roads, road painting and another making, installation of crash barriers, traffic signs, etc.	b. Architectural, see 71101 and engineering activities, see 71102 c. project management activities related to civil engineering works, see 71102
42103	Construction of bridges, including those for elevated highways.		
42104	Construction of tunnel.		
42105	Construction of railways and subways.		
42106	Construction of airfield/airport runways.		
42109	Construction of roads and railways n.e.c		

Table 2.4: Description, Class and Item of MSIC 2008 Section F, Division 42, Group 42 Construction of Utility Projects

(Source: MSIC 2008)

Item	Description	Includes	Excludes
42201	Long-distance pipelines, lines of communication and power lines.		Project management activities related to civil engineering works, see 71102
42202	Urban pipelines, urban communication, and power lines; ancillary urban works		
42203	Water main and line construction.		
42204	Reservoirs.		

42205	Construction of irrigation systems (canals).		
42206	Construction of sewer systems (including repair) and sewage disposal plants		
42207	Construction of power plants		
42209	Construction of utility projects n.e.c.	Water well drilling and pumping station	

Table 2.5: Description, Class and Item of MSIC 2008 Section F, Division 42, Group 429 Construction of Other Civil Engineering Projects

(Source: MSIC 2008)

Item	Description	Includes	Excludes
42901	Construction of refineries		Project management activities related to civil engineering works, see 71102
42902	Construction of waterways, harbour and river works, pleasure ports (marinas), locks		
42903	Construction of dams and dykes		
42904	Dredging of waterways		
42905	Outdoor sports facilities		
42906	Land subdivision with land improvement	Adding of roads, utility infrastructure, etc	
42909	Construction of other engineering projects n.e.c.		

2.5 Key Stakeholders

Government organizations, regulatory entities, industry organizations, and professional bodies are significant stakeholders in Malaysia's construction industry. Stakeholders are individuals,

groups, or organizations who have an interest or concern in a company. Stakeholders have the ability to influence or be influenced by the organization's actions, goals, and policies.

2.5.1 Government Agencies and Regulatory Bodies

Table 2.6 outlines the government agencies that are enabled by legislation, based on the scope and authority granted in the corresponding statutes that directly regulate Malaysia's Civil Engineering Construction.

Table 2.6: List of Government Agencies and Regulatory Bodies for Construction of Civil Engineering

NO.	ORGANIZATIONS	OVERVIEW, ROLES FUNCTIONS AND RESPONSIBILITIES
1.	Ministry of Transport Malaysia (MoT)	<p>The Ministry of Transport Malaysia is fundamentally a policy formulating, planning and supervising entity and its regulatory and policy implementing functions are carried out by various statutory agencies under its purview. The functional responsibilities are structured into three divisions – Land and Logistics, Maritime, and Aviation. These agencies oversee the development of all aspects of the logistics economy, from its infrastructure development, international harmonization of the flow of goods, governance of logistics activities to policy development. The enforcement and regulatory duties for land transport are under the responsibilities of agencies such as the Road Transport Department (JPJ), Department of Railways, Railway Assets Corporation (RAC), Road Safety Department (RSD) and the Malaysian Institute of Road Safety Research (MIROS). Their statutory authority is defined by two main Acts:</p> <ul style="list-style-type: none"> a) Road Transport Act 1987 b) Railways Act 1991.
2.	Ministry of Works Malaysia (MoW)	MoW was formed in 1956 and has changed names several times since then until the Government decided to rename

		<p>the Ministry as the Ministry of Works Malaysia in the 1980s. The name stays until this day. The functions of the Ministry of Works that are related to the construction of buildings industry are:</p> <ul style="list-style-type: none"> a) To plan the development of the Federal Road networks nationwide. b) To coordinate and monitor the implementation of the Federal Road projects and other projects under the supervision of MoW. c) The development of Bumiputera entrepreneurs in the construction industry. d) To give advice and support services to CIDB in the development of the country's construction industry and skilled workforce. e) To plan and implement national infrastructure projects, especially roads, highways, and Federal Commonwealth Buildings (BGP). f) Coordinate the agenda under the Infrastructure Cluster.
3.	Ministry of Rural Development (MRD)	<p>The Ministry of Rural Development (<i>Kementerian Pembangunan Luar Bandar</i>), abbreviated KPLB, is a ministry of the Government of Malaysia that is responsible for rural development, regional development, community development, Bumiputera, Orang Asli, rubber industry smallholders, land consolidation, land rehabilitation. The Rural Road Program (JALB) was launched in 1977 through the Accelerated Rural Road Program (ARRP), which aims to accelerate and increase road construction to provide much-needed communication systems in rural areas. To improve and expand the rural transportation system 'in addition to ongoing efforts towards improving the coverage and network of the road system in rural areas. This effort is in line with KPLB's aspiration to provide high-quality services through an efficient and effective delivery system</p>

		to meet the growing needs of the people. In addition, the JALB program is also in line with KPLB's goal to expand the coverage of basic infrastructure to cover 100% of villages in Peninsular Malaysia and 80% of villages in Sabah and Sarawak.
4.	Ministry of Agriculture and Food Industries (MAFI)	The Ministry of Agriculture and Food Industries (<i>Kementerian Pertanian dan Industri Makanan</i>), abbreviated MAFI, is a ministry of the Government of Malaysia that is responsible for agriculture, agro-based industry, agritourism, livestock, veterinary services, fisheries, quarantine, inspection, agricultural research, agricultural development, agricultural marketing, pineapple industry, agribusiness, botanical garden, food security, food sovereignty.
5.	Public Work Department (PWD)	The Malaysian Public Works Department (JKR; <i>Jabatan Kerja Raya Malaysia</i>) is the federal government department in Malaysia under the Ministry of Works Malaysia (MOW), which is responsible for the construction and maintenance of public infrastructure in West Malaysia and Labuan. In Sabah and Sarawak, a separate entity of the Public Works Department exists under the respective state government's jurisdiction, but both departments are also subordinate to the parent department at the same time.
6.	Department of Agriculture (DoA)	The Department of Agriculture (DoA) or <i>Jabatan Pertanian</i> has established one (1) 'repository' of land information, land use, soil erosion, soil conservation and data related to land resources for Peninsular Malaysia which this information is beneficial either to other government departments or to the private sector that will implement development projects. The updated information is provided in the form of maps as well as geospatial documents that can be purchased through the Land Resource Management Division, Department of Agriculture.

7.	Forestry Department of Peninsular Malaysia (DFPM)	<p>The Forestry Department of Peninsular Malaysia or <i>Jabatan Perhutanan Semenanjung Malaysia</i> (JPSM) is one of the departments under the Ministry of Energy and Natural Resources Malaysia and consists of the Forestry Headquarters of Peninsular Malaysia, 11 State Forestry Departments and 33 District Forest Offices throughout Peninsular Malaysia. The Department is headed by the Director-General of Forestry and assisted by two Deputy Directors General of Forestry. At the end of 2014, the total workforce was 5,121 people. Section 16 of the National Forestry Act 1984 empowers the State Government Authority to allow the extraction of forest products from Permanent Forest Reserves and Government Land by way of license or sub-license through 3 ways.</p>
8.	Department of Irrigation and Drainage (DID)	<p>The Department of Irrigation and Drainage (<i>Jabatan Pengairan dan Saliran – JPS</i>) has moved from the Ministry of Agriculture & Agro-based Industry (MOA) to the Ministry of Natural Resource & Environment (NRE) on March 27th, 2004. The Department, which is under the direction of the Ministry of Natural Resource & Environment, has over the years taken on new and expanded responsibilities. It divides its function into categories under Building and Infrastructure Division. Building and Infrastructure division is responsible for the planning, designing, and construction works for buildings projects as well as other related structures. This Division provides technical consultation services, project management services as well as operational and maintenance management services through four (4) units as follows:</p> <ol style="list-style-type: none"> <li>i. Project Management Unit <li>ii. Development Unit <li>iii. Planning Unit

		iv. Administration Unit
9.	Sewerage Services Department (SSD)	The Sewerage Services Department (JPP) or <i>Jabatan Perkhidmatan Pembentungan (JPP)</i> was established in 1994 following the Malaysian parliament's passage of the Sewerage Services Act 1993 (ACT 508). The primary purpose of the JPP was established is to regulate existing sewerage services and systems and is operated by either the Government or the private sector throughout the country. Until now, the sewerage operations of all Local Authorities in Peninsular Malaysia have been taken over by JPP except PBT in Kelantan, Johor Bahru City Council and Pasir Gudang PBT, as well as PBT in Sarawak and Sabah.
10.	Department of National Heritage (DNH)	Starting from the Heritage Division under the Ministry of Tourism, Arts and Culture Malaysia (KeKKWa) and upgraded as a department on 1 March 2006. Responsible for preserving and maintaining the country's heritage as stipulated in the National Heritage Act 2005. The main functions of the National Heritage Department are: <ul style="list-style-type: none"> i) Enforce the provisions under the National Heritage Act 2005 Establish a network of cooperation with agencies from within and outside the country related to heritage
11.	Department of Mineral and Geoscience Malaysia (JMG)	JMG is a government agency that has the authority and expertise to lead the investigation, services, and research in the field of minerals and geoscience in the country. This is done through the acquisition (acquisition), interpretation (interpretation), management (management) and distribution (dissemination) data and minerals and geoscience information. Knowledge, data and minerals and geoscience information can be used to solve problems, help improve the well-being of society, and contribute to the socio-economic development and preservation of the environment and disaster risk management.

12.	Department of Occupational Safety and Health (DoSH)	The DoSH is 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 activity sectors, which include construction.
13.	Department of Environment (DoE)	Established in 1975, the DoE of Malaysia is responsible for the prevention, control, and abatement of pollution in the country through the enforcement of the Environmental Quality Act of 1974 and its subsidiary legislation. The DoE is the federal authority in Malaysia that also monitors the air and water quality and noise, manages toxic and hazardous wastes based on the "cradle-to-grave" principle and implements the Environmental Impact Assessment system.
14.	Construction Industry Development Board (CIDB)	The CIDB was established under the Construction Industry Development Board Act 1994 (Act 520) to regulate, develop, and facilitate the construction industry towards achieving global competitiveness. The Board advises the Federal and State Governments, as well as other stakeholders, on matters affecting or connected with the construction industry.
15.	<i>Suruhanjaya Perkhidmatan Air Negara (SPAN)</i>	SPAN or the Water Services Commission is a technical and economic regulatory body for the water supply and sewerage services in Peninsular Malaysia and the Federal Territories of Putrajaya and Labuan. The Commission regulates all entities in the water supply and sewerage services industry in accordance with the Water Services Industry Act 2006 (Act 655), which was enforced on 1 January 2008.
16.	Energy Commission	A statutory body established under the Energy Commission Act 2001, the Energy Commission is responsible for regulating the energy sector, specifically the electricity and piped gas supply industries, in Peninsular Malaysia and

		Sabah. The focus of the Commission is reliable electricity and gas supply, ensuring reasonable costs and safety. The roles of the Energy Commission are divided into three, namely Economic Regulation, Technical Regulation and Safety Regulation.
17.	Standard and Industrial Research Institution of Malaysia (SIRIM) Berhad	SIRIM Berhad is a corporate organization wholly owned by the Malaysian Government, under the Minister of Finance Incorporated. It has been entrusted by the Malaysian Government to be the national organization for standards and quality and as a promoter of technological excellence in the Malaysian industry.
18.	Malaysian Institute of Road Safety Research (MIROS)	The MIROS was established in 2007 to function as a one-stop centre for the generation and dissemination of road safety information through various media and a concerted training programme. The Institute carries out strategic studies and evaluates current procedures on road safety to generate information that will form the core of its evidence-based intervention programmes to enhance road safety.
19.	Local Authorities (PBT)	PBT is the governing body that organizes, plan and implement local development control in line with the designated planning. Laws and guidelines have been established to ensure a balance of development so as not to contradict the Government policy. Compliance with the policies and guidelines of the Local Plan is essential to ensure the sustainable development of local authorities. Department of Local Government (JKT), through Development Control Consultation Division, has been mandated to identify the relevant Act and related laws in line with modern requirements and changes. The Division also provides advice on legal compliance as well as managing the business with regards to the development controls to the local authorities.

20.	The Land Public transport Agency (APAD)	APAD is an agency under the Ministry of Transport Malaysia (MOT) required for the content, policy and strategy of licensing programs, public content, services, rail, bus, terminal, taxi, and e-hailing as well as goods through roads and highways.
21.	<i>Pengurusan Aset Air Berhad (PAAB)</i>	PAAB is committed to maintaining a high standard of corporate governance in the conduct of its businesses and operations. The high standard of corporate governance plays an important role in PAAB's growth, sustainability, and success. Integrity & Governance Department is the catalyst responsible for sparking a culture of integrity through the implementation of four (4) core functions; Complaint Management; Detection & Verification; Integrity Strengthening; and Governance. By ensuring the best governance in practice, it will strengthen staff integrity as well as address the issues related to integrity, especially corruption, practice, and abuse of power.
22.	<i>Tenaga Nasional Berhad (TNB)</i>	<p>The application process incorporates not only TNB requirements but considering the Government Development Plan Approval Process in Peninsular Malaysia issued by the <i>Bahagian Perancangan Dasar & Pembangunan Kementerian Perumahan dan Kerajaan Tempatan</i>. The inclusion of the said Government procedure shall ensure:</p> <ul style="list-style-type: none"> • Infrastructure planning and approval process of the TNB complements the National Policy • TNB as a Member Agency of the Government Development Plan Committee must ensure complete transparency of its process through timely responses to Development Plan Approval Process • TNB Supply Application Process ensures complete agreement of Distribution Division's plans and the Consultant Engineers submissions, especially on the

		location and size of substations needed for the supply of electricity to the development area and is valid for 2 years after the approval from the relevant Local Authority.
23.	<i>Gas Malaysia Berhad</i>	<i>Gas Malaysia Berhad</i> was established on 16 May 1992 to sell, market, and distribute natural gas as well as to develop, operate and maintain the Natural Gas Distribution System (NGDS) within Peninsular Malaysia. We are licensed under the Gas Supply Act 1993 to supply and sell reticulated natural gas in Peninsular Malaysia.
24.	<i>Lembaga Lebuhraya Malaysia (LLM)</i>	LLM is a statutory body that was established on 24 October 1980 in accordance with Act 231 (Corporation 1980). The purpose of the establishment of the LLM is to supervise and implement the design, construction, control, operation, and maintenance of highways, impose, and collect tolls, enter into contracts and make provisions in respect of matters relating thereto. Responsible for monitoring the implementation of the construction of new highway projects/ highway upgrading projects/ new or delayed interchange construction projects from the initial stage after the concession agreement is signed/ in accordance with the stipulations in the concession agreement.
25.	Keretapi Tanah Melayu Berhad (KT MB)	Malayan Railways Limited is the main rail operator in Peninsular Malaysia. The railway system dates to the British colonial era when it was first built to transport tin. Previously known as the Federated Malay States Railways (FMSR) and the Malayan Railway Academy (MyRA), <i>Keretapi Tanah Melayu</i> acquired its current name in 1962. The organization was corporatized in 1992 but remained wholly owned by the Malaysian Government.
26.	Royal Malaysian Police (PDRM)	Provide uniformed law enforcement officers, including marked law enforcement vehicles, to assist in controlling and directing traffic in the work zone when the following type of work is necessary on projects:

		<ol style="list-style-type: none"> 1) Directing traffic/overriding the signal in a signalized intersection. 2) When Design Standards, Index No. 619 is used on freeway facilities (interstates, toll roads, and expressways) at night-time for work within the travel lane. 3) When Design Standards, Index No. 655 Traffic Pacing for overhead work is called for in the Plans or approved by the Engineer. 4) When pulling conductor/cable above an open traffic lane on limited access facilities, when called for in the Plans or approved by the Engineer. 5) When Design Standards, Index No. 625 Temporary Road Closure 5 Minutes or Less is used.” 6) control road closures and deviations
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2.5.2 Industry Associations and Professional Bodies

This section includes the activity of numerous trade organizations and professional bodies involved in building construction. The review's scope includes professional services offered to the construction industry. Regulations governing these professional services will benefit the building construction industry and, in turn, the entire economy. Table 2.7 lists industry organizations and professional bodies associated with the construction of roads and railways Industry.

Table 2.7: List of Related Industry Associations and Professional Bodies for Construction of Civil Engineering Industry

NO.	ORGANIZATION S	OVERVIEW, ROLES FUNCTIONS AND RESPONSIBILITIES
1.	Board of Engineers Malaysia (BEM)	The BEM is a statutory body constituted under the Registration of Engineers Act 1967 with perpetual succession and a common seal. BEM's primary role is to facilitate the registration of engineers, engineering

		Technologists, inspectors of works, sole proprietors, partnerships, and corporate bodies providing professional engineering services and to regulate the professional conduct and practice of registered persons in order to safeguard the safety and interest of the public.
2.	Board of Architects Malaysia (MAB)	<p>The Board of Architects Malaysia is a statutory authority responsible for the enforcement of the Architects Act 1967. The functions of the Board are provided under Section 4(1) of the aforesaid Act, which includes the following:</p> <ul style="list-style-type: none"> a) Registration of Architects, Graduate Architects, Interior Designers and Building Draughtsmen. b) Registration of architectural consultancy practices. c) Regulation of their conduct and ethics. d) Representing the architectural profession in any matter at local and international levels.
3.	Board of Quantity Surveyors Malaysia (MBQS)	<p>The Board of Quantity Surveyors Malaysia was set up by an Act of Parliament, i.e., Quantity Surveyors Act 1967 (revised 2002). The Board consists of a President, a Registrar and sixteen (16) members appointed by the Minister of Works, Malaysia. The functions of the Board include:</p> <ul style="list-style-type: none"> a) Keep and maintain a Register of Quantity Surveyors. b) Order the issuance of a written warning or reprimand, the imposition of a fine, suspension, cancellation, removal, or reinstatement in accordance with Part III and IV Quantity Surveyors Act. c) Act as a stakeholder in a contract for consulting quantity surveying services, deemed necessary by the Board. d) Appoint members of the Board to sit on any board, committee or body formed for purposes relating to the profession and to appoint members of the Board to sit on the Board of Engineers and the Board of Architects in accordance with the relevant laws.

4.	Land Surveyors Board (BLS)	<p>The Land Surveyors Board, established on 1st May 1958, under the Licensed Land Surveyors Act 1958 (Act 458), is a corporate body responsible for</p> <ul style="list-style-type: none"> i) Controlling and maintaining standards for land surveyors and other related matters ii) Regulating the practice of land surveying in Peninsular Malaysia iii) Keeping the surveying profession abreast with the latest development and advancement in survey sciences
5.	Association of Consulting Engineers Malaysia (ACEM)	<p>The ACEM was established in 1963 with the object of promoting the advancement of the profession of consulting engineering by associating together for consultation and cooperation those engineers whose work is of a purely consultative character and of providing facilities for Government, public bodies, associations representing industry and trade, and other to confer with Consulting Engineers as a body and to ascertain their collective views. One of the primary objects of the Association is to ensure that Consulting Engineers undertaking to advise on engineering matters shall be fully qualified engineers in their respective fields and should act in all professional matters in a strictly fiduciary capacity to their clients.</p>
6.	National Institute of Occupational Safety and Health (NIOSH)	<p>NIOSH is committed to excellence in the provision of products and services such as high-quality training, consultancy, research, and dissemination of information related to occupational safety and health to meet customers needed through continuous improvement.</p>
7.	Malaysia Board of Technologists (MBOT)	<p>MBOT is a professional body that gives Professional Recognition to Technologists and Technicians in related technology and technical fields. Based on Act 768, MBOT expands its function vertically and horizontally whereby MBOT looks at the technology-based profession that cuts</p>

		<p>across discipline based on conceptual design to a realized technology and covers from Technicians (with SKM/Diploma Level) up to Technologists (Bachelor's Degree level and above). These professionals (Technologists and Technicians) have integrated roles from concept to reality.</p>
8.	<p>Road Engineering Association of Malaysia (REAM)</p>	<p>Today, REAM has some 850 members comprising public and corporate professionals from the Malaysian road industry in its register. All REAM members are automatically members of REAAA. REAM is actively involved in the following activities for the betterment of the Malaysian road industry:</p> <ul style="list-style-type: none"> i) Production of new and updating of existing guidelines, standards and specifications relating to road engineering. ii) Organizing conferences, seminars, forums, and exhibitions for the benefit of the road engineering community. iii) Organizing overseas delegations for participation in road-related events, including conferences, seminars, and forums. iv) Creating a spirit of camaraderie among the Malaysian road engineering community through hosting social functions such as biennial dinners and annual golf tournaments. v) From the surpluses accrued from the above activities, REAM plays a pivotal role in providing financial aid to needy students in local public universities pursuing engineering and or transport-related disciplines under its corporate social responsibility initiatives.

		vi) Organizing essay and technical paper presentation competitions to encourage young graduates to excel in writing conference/seminar/forum papers
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2.5.3 Training Centres

This section provides information regarding available training centres in Malaysia that provide training related to the construction of roads and the railways' industry. The five main training centres are listed in Table 2.8.

Table 2.8: Training Centers Offering Courses in Construction of Civil Engineering Industry

NO.	ORGANIZATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
1.	Malaysian Academy of Buildings (<i>Akademik Binaan Malaysia -ABM</i>)	ABM or the Malaysian Academy of Buildings is a CIDB assessment and training centre, which caters to the needs and development of skills for construction workers. ABM focuses on equipping construction personnel with the appropriate standards by industry. Programmes and courses offered by ABM include: a) Construction Skills Competency Training Programme (for youths and existing construction workers) b) Construction Skills Competency Assessment c) Customized Programmes d) Safety and Health Induction Course for Construction Workers (SICW) (Green Card) e) Construction Certification Programme f) Continuing Professional Development.
2.	GIATMARA	The establishment of GIATMARA aims to provide technical and vocational skills training to youths in rural areas and in towns to enable them in acquiring skills as preparation to become skilled workforce and technical

		entrepreneurs in meeting the needs of the industry and needs of economic development as well as entrepreneurship within local areas and in the country.
3.	TVETMARA	MARA Technical and Vocational Division is accountable for developing and maintaining TVET educational programmes that prepare students for occupations important to Malaysia's economic development. TVETMARA includes institutes such as <i>Kolej Kemahiran Tinggi MARA</i> , MARA-Japan Industrial Institute and Institut Kemahiran MARA. Courses related to the construction of roads and railways include a Certificate in Water Supply and Sewerage Technology and Diploma in Construction Engineering Technology (Roads And Transportation).
4.	<i>Institut Latihan Perindustrian (ILP)</i>	ILP or the Industrial Training Institute (ILP) is a training institute to produce skilled labour to meet the demands of the industrial sector in Malaysia. ILP is managed by the Department of Human Resources and has been producing national talents from the training certificate level to the Advanced Diploma in various skill courses. Courses related to the construction of roads and railways include Oil and gas pipeline installation technology, DVM Oil and gas pipeline installation technology and Diploma in Construction Engineering Technology (Civil and structure)
5.	<i>Institut Kemahiran Belia Negara (IKBN)</i>	IKBN or the National Youth Skills Institute is a skill-based institution under the auspices of the Ministry of Youth and Sports Malaysia. Courses on the construction of roads and railways include Certificate in Civil Technology (Construction Landscape), Diploma in Civil Technology (Civil & Structural), Certificate in Civil Technology (Plumbing) and Advanced Certificate and Diploma in Public Technology (Public & Structural Supervision).

6.	MMC-Gamuda Tunnelling Training Academy (TTA)	With an established reputation for delivering large-scale projects on time coupled with innovative engineering solutions, MMC Gamuda has cemented its position as a global infrastructure company and leading project integrator in the country. The first project undertaken and completed by MMC Gamuda was the construction of the Stormwater Management and Road Tunnel (SMART), which made history as the world's first dual-purpose tunnel and began operations in 2007
7.	Malaysian Technical University (MTU)	MTUN started with the establishment of University Colleges in early 2000. MTU specializes in higher technical and technology programmes which are practical-oriented. The four university colleges then were KUiTTHO, KUTKM, KUKTEM and KUKUM. For mutual benefits, the Technical University Colleges Network (TUCN) of Malaysia was officially formed in March 2006. In February 2007, all four university colleges underwent a rebranding initiative and henceforth emerged as full universities. The universities are UTHM, UTeM, UMP dan UniMAP. Pursuant to this, TUCN is rebranded to MTUN or the Malaysian Technical University Network. Subsequently, in 2015, MTUN was redefined as MTU, which is in line with its aspiration towards a consortium.
8.	American Petroleum Institute (API)	API's Individual Certification Programs (ICP) have provided the petroleum and petrochemical industries with an independent and unbiased way to evaluate the knowledge and experience of technical and inspection personnel. These certification programs are based on industry-developed standards that are recognized and used with confidence worldwide.
10.	National Institute of Occupational Safety and Health (NIOSH)	NIOSH is committed to excellence in the provision of products and services such as high-quality training, consultancy, research, and dissemination of information

		related to occupational safety and health to meet customers needed through continuous improvement.
11.	Institute of Engineers Malaysia (IEM)	IEM opens the doors of young minds who dare to dream. It encourages the spirit of free inquiry and imagination. The Institute tries to indicate the sense of human values and discipline to make students respectful towards human beings, realize and demonstrate their best potential and be a winner in life. The Institute is affiliated to WBUT. B.Tech., M.Tech., MBA courses are under AICTE, Govt. of INDIA.
12.	<i>Pusat Kecemerlangan Kejuruteraan dan Teknologi Jabatan Kerja Raya (CREaTE)</i>	CREaTE in Alor Gajah Melaka has commenced operations on 1 September 2016. CREaTE was created to achieve the goal of producing competent, professional, creative, and innovative users using the latest technology through human capital development and continuous training programs. This is in line with PWD Malaysia's aspiration to become a world-class service provider and centre of excellence in the field of asset management, project management and engineering services.
13.	TWI Technology Sdn. Bhd	A membership-based organization supports both individuals and companies alike. Exist to provide authoritative and impartial expert advice, know-how and safety assurance through engineering , materials and joining technologies , helping you design, create and operate the best products possible. Descended from the British Welding Research Association (BWRA), we have grown into one of the foremost independent research and technology organizations. It spans innovation, knowledge transfer and problem resolution across all aspects of welding, joining, surface engineering, inspection, and whole-life integrity management. TWI's single-client projects bring together experts from TWI and the Member to provide solutions directly focused on assisting the Member's business. The work undertaken is confidential

		with the outcomes and associated intellectual property owned exclusively by the client
14	Malaysian Railway Academic (MyRA)	Malaysian Railway Academy (MyRA), formerly known as Akademi KTM, was established as a private higher educational institution under the Private Higher Educational Institutions section 52 of the companies act 1965 in October 1991. Managed by <i>Keretapi Tanah Melayu Berhad</i> (KTMB), MyRA offers a wide range of educational opportunities in the field of training, education, and development. It all started in January 2009 with the establishment of the Learning Resource Centre in Batu Gajah, Perak. At that time, it offered training and education development, known itself to become the hub for Railway Related Industrial professional and advanced technical training centre. In terms of Training and Education Development, MyRA has identified 5 Categories as Development Program, Management Program, Safety Program, Operational and technical Program and <i>Jabatan Pembangunan Kemahiran</i> (SLDN).

2.6 Legislation, Policies, and Initiatives

It is crucial that this study refers to legislation, by-laws, and regulations that are directly relevant to the building industry's construction.

2.6.1 Government Legislation

The following laws apply to the construction industry in Malaysia:

a) Street, Drainage and Building Act 1974 (Act 133)

An Act to revise and consolidate the laws governing roadway, drainage, and building in Peninsular Malaysia's local authority regions and for other reasons. The Act is divided into eight sections, each of which contains provisions on roads, trenches, buildings, back alleys, varied by-laws, and abolition and transitional provisions, totalling one hundred and thirty-five (135) sections. Uniform Building by Law, often known as UBBL 1984, is a building code that

establishes minimum standards for the control and construction of streets, drainage, and buildings in local government areas. It is a subsidiary law under the Street Drainage and Building Act 1974 (Act 133). Preliminary submission of plans for approval, space light and ventilation, temporary works, structural requirements, fire requirements, fire alarms, fire detection, fire extinguishment and firefighting access, and miscellaneous are the nine elements of the building code. Each state publishes the UBBL 1984 in order for local governments to adopt and enforce it. The Ministry of Federal Territory is the state entity in charge of Kuala Lumpur, Labuan, and Putrajaya.

b) Occupational Safety and Health Act 1994 (Act 514)

The Malaysian parliament gazetted the Occupational Safety and Health Act 1994 on 25 February 1994. The Act's aims are as follows:

- i) To secure the safety, health and welfare of persons at work against risks to safety or health arising out of the activities of persons at work;
- ii) To protect persons at a place of work other than persons at work against risks to safety or health arising out of the activities of persons at work
- iii) To promote an occupational environment for persons at work which is adapted to their physiological and psychological needs;
- iv) To provide the means whereby the associated occupational safety and health legislations may be progressively replaced by a system of regulations and approved industry codes of practice operating in combination with the provisions of this Act designed to maintain or improve the standards of safety and health.

c) Factories and Machinery Act 1967 (Act 139)

An act to provide for the control of factories with respect to matters relating to the safety, health and welfare of persons therein, the registration and inspection of machinery and for matters connected therewith. The Factory and Machinery Act 1967 are divided into six parts:

- i) Preliminary
- ii) Safety, health and welfare
- iii) Person in charge and certificates of competency
- iv) Notification of accident, dangerous occurrence and dangerous diseases
- v) Notice of occupation of the factory and registration and use of machinery
- vi) General

d) Federal Roads Act 1959 (Act 376)

An act to provide for the declaration of federal roads, bridges, ferries and other means of communication. This Act shall apply throughout Malaysia. The Minister may, after consultation with the Government of the State concerned, by order declare any road, bridge, ferry or other means of communication in any State to be Federal.

e) The Quantity Surveyors Act 1967 (Act 487)

This Act provides for the establishment of the Board of Quantity Surveyors, for the registration of Quantity Surveyors and approval to the practice of firms or corporate bodies practising as consulting Quantity Surveyors, for the regulation of the practice of quantity surveying and for matters connected.

f) The Construction Industry Development Board Act 1994 (Act 520)

An act to provide for the establishment of the CIDB and to provide for its function relating to the construction industry and for matters connected. An amendment to the Act was made in 2011 - Act 520 (Amendment 2011) - and was gazetted by the Works Minister to come into force on 1 June 2015. The amendment's main focus was construction quality and safety.

- i) Enhancing construction quality through registration of construction personnel as well as skills and competency certification;
- ii) Ensuring the quality of building material and compliance with standards; and
 - ii) Contractors and site managers' responsibility to ensure the safety of buildings during or after the construction work

g) The Registration of Engineers Act 1967 (Act 138)

This Act provides for the registration of engineers, and sole proprietors, partnerships and bodies corporate providing professional engineering services and for purposes connected therewith.

h) The Architects Act 1967 (Act 117)

This Act regulates the registration of architects, sole proprietors, partnerships, and corporations that provide architectural consulting services, as well as building draughtsmen and other related topics.

2.6.2 Government Policies and Initiatives

This section contains information on government policies and activities that affect the construction industry in Malaysia. In Malaysia, there are a number of policies related to construction in particular, and there are immediate policies guided by the current situation have been issued. Among them are:

2.6.3 Shared Prosperity Vision 2030 and Pandemic Covid-19 Initiatives

In the national economic planning plan, the construction sector is always given priority. The Government of Malaysia introduced the Shared Prosperity Vision 2030 to provide a decent living standard to all Malaysians by 2030. Under this Act, the goal is set to achieve RM 3.4 trillion GDP with a 4.7% increase in annum growth rate within the period of 2021 to 2030. The vision blend of long-term policy and the ethical, environmental plan was introduced in Malaysia, commonly referred to as National Transformation Plan 2050 (TN50).

The Works Ministry (KKR) has launched the KKR Organisational Strategic Plan 2021-2025, which is based on four thrusts focusing on the construction industry's efforts in reviving Malaysia's economy towards realizing the Shared Prosperity Vision 2030. The plan has taken into account environmental analysis and current issues besides emphasizing the Ministry's strategic collaboration with public and private institutions, namely to produce local construction industry personnel to fill the quality employment opportunities. The strategic plan also took into consideration the ability to realize the 12th Malaysia Plan, preparedness to explore the IR4.0 and upcoming policies. The service delivery method of the KKR ministry and its agencies such as the Public Works Department (PWD), CIDB, LLM and three professional boards would be transformed through the use of digital technology to ensure planned projects would give optimal benefits to the people. The construction industry had suffered a loss of RM11.6 billion due to the Covid-19 pandemic, and many problems had arisen following the closure of construction sites, such as job losses and so on. Through the Economic Stimulus Package (ESP), the Works Ministry had implemented 1,056 projects worth RM410.6 million under the ESP 1.0 and Prihatin ESP in the year 2020. Mid-2021, the People's Protection and Economic Recovery Package or PEMULIH, worth RM150 billion, was launched. PEMULIH is an additional package of economic recovery long-awaited by practitioners in the construction industry.

2.6.4 Industrialized Building System Initiative

CIDB has begun to industrialize the industry using the Industrialized Building System in an effort to shift away from Labour-intensive tasks (IBS). This project strives to create and provide high-quality, cost-effective products while keeping the sector competitive. IBS provides high-tech construction procedures in which components are made in a controlled environment, either on-site or off-site and then placed and assembled into construction projects. The IBS Centre, which houses the IBS Info Gallery, IBS Component Gallery, IBS Show Village, and IBS Testing Facilities, is established by CIDB as a one-stop reference centre (known as Construction Research Institute of Malaysia (CREAM)).

2.6.5 Work Distribution Policy to Class G1 and G2

Beginning in 2008, the Ministry of Public Works implemented a 10% Distribution Policy for Class G1 (previously known as Class F) contractors on projects valued at RM10 million or more. However, on May 7, 2009, this regulation was suspended, and in 2010, it was improved and extended to Class G2 (previously known as Class E) contractors. This strategy, known as the Work Distribution Policy to Class G1 and G2 (Bumiputera) and implemented through the allocation of funds in tender papers for projects of RM 10 million and above, intends to provide more job opportunities to Class G1 and G2 contractors in light of their huge number. Furthermore, the adoption of this policy will provide exposure to Class G1 and G2 contractors, allowing them to participate in the implementation of significant projects while also improving their building skills.

2.7 Industry and Market Analysis

Industry and market intelligence refers to the gathering and analysis of data from numerous sources in order for an industry to make commercial choices, personnel developments, and training requirements. Industry information is essential for formulating plans for industry development, manpower development, and the impact of such advances. Based on industry growth and employment figures, this section will provide information on building construction.

2.7.1 Growth of Construction of Roads and Railways Industry

Malaysia's GDP increased by 4.7 per cent in 2018 compared to 5.7 per cent the previous year, according to the National Account Gross Domestic Product 2015-2018. 34. Malaysia's GDP

was RM1,361.5 billion in 2018, with the service and manufacturing sectors accounting for 56.7 per cent and 22.4 per cent, respectively. Meanwhile, the Private Final Consumption Expenditure was the key driver of expenditure.

The construction of the buildings industry was the topic of this study. The construction sector contributed 4.7 per cent to Malaysia's GDP in 2015, 4.8 per cent in 2016, and 4.9 per cent in both 2017 and 2018³⁵. The percentage share for building construction is the sum of contributions from both residential and non-residential buildings. From 2.6 per cent in 2015 to 2.5 per cent in both 2016 and 2017 to 2.3 per cent in 2018, the value has fallen.

The construction industry's yearly percentage change from 2016 to 2018 shows that it is slightly falling in terms of per cent by year. The construction industry's yearly percentage change was 7.4 per cent in 2016, but it fell throughout the year to 4.9 per cent in 2017 and 7.3 per cent in 2018.

2.7.2 Employment Statistic

This section gives an overview of Malaysia's labour force, employed, outside the labour force, and Labour Force Participation Rate (LFPR) and unemployment rate. Figure 2.1 shows the Labour force Malaysia March 2021.

a) Labour Force

Those who are employed or unemployed during the reference week and are between the ages of 15 and 64 (in completed years at last birthday) are referred to as the labour force. In April 2020, the number of people in the labour force increased by 0.6% (+99.1 thousand people) to 15.71 million, the lowest increase since September 2014. On a month-to-month basis, the labour force declined by 0.8% (-130.7 thousand people) in March 2020 compared to March 2019.

b) Employed

Employed refers to anyone who worked for money, profit, or family gain for at least one hour during the reference week (as an employer, employee, own-account worker or unpaid family worker). Persons who did not work during the reference week due to illness, injury, bad weather, leave, labour disputes, social or religious reasons, but who had a job, farm, enterprise, or another family enterprise to return to are also deemed employed. Those on a paid temporary layoff which would be called back to work are also mentioned. Year on year, the working

population fell by 156.4 thousand people (-1.0 per cent) to 14.93 million people. The Manufacturing and Services industries, specifically accommodation and food & beverage; arts, entertainment & recreation; and other services such as beauty centres and salons, were the most affected.

c) Outside Labour Force

Outside labour force refers to anyone who isn't classed as employed or jobless in the manner described above. Housewives, students (including those pursuing higher education), retired, disabled people, and those who are not looking for work are all included. In comparison to the same month the previous year, the outside labour force climbed by 160.7 thousand people (2.2 per cent) to 7.35 million. Housework/family duties (43.3 per cent) and schooling were the most common reasons for being out of the labour field (40.2 per cent).

d) Labour Force Participation Rate (LFPR)

The economic activity of a population is determined by its demographic characteristics. As a result, the proportion of the population which is economically active varies by subgroup. Specific activity rates referred to as the labour force participation rate, are used to measure these differences. The labour force participation rate stated as a percentage is the ratio of the labour force to the working-age population (15 to 64 years). In April 2020, the labour force participation rate of LFPR fell 0.5 percentage points to 68.1 per cent.

e) Unemployment Rate

The unemployment rate is the percentage of people who are jobless compared to the total number of people in the labour force. This rate is the percentage of the workforce that is unemployed. The unemployment rate increased to 5.0 per cent, with 778.8 thousand people unemployed, up 48.8% from a year before. The closure of most firms during the Movement Control Order (MCO), which has been extended until April 2020, has resulted in job losses, with job seekers finding it difficult to find work.

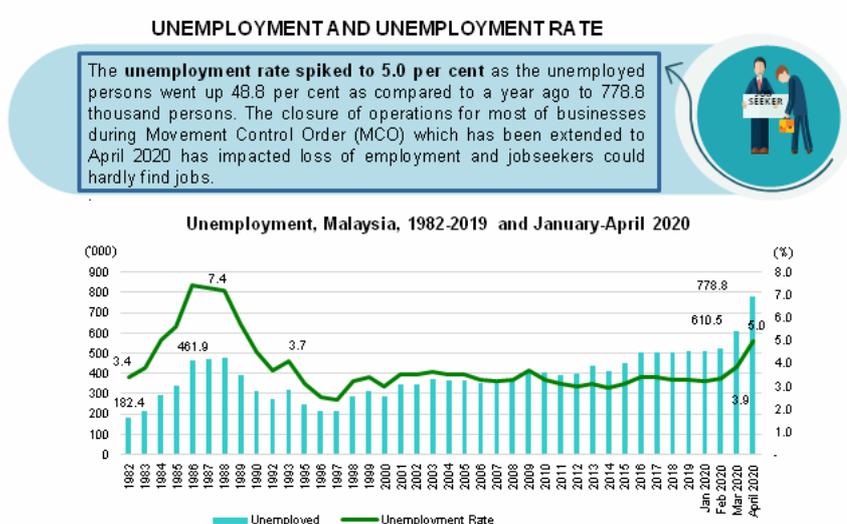
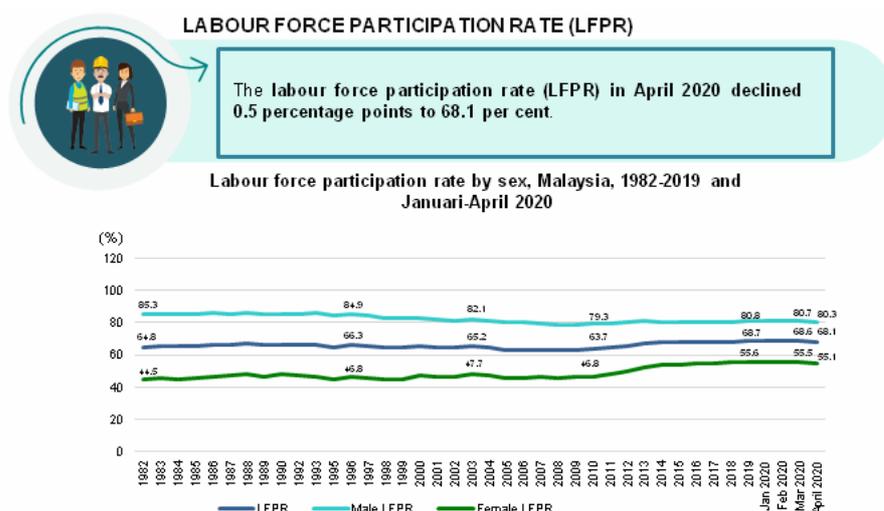


Figure 2.1: The Labour Force Participation Rate (LFPR)
(Source: Department of Statistics Malaysia, 2021)

2.7.3 Malaysia's Labour Force Improved Further in March 2021

Since the spread of Coronavirus Disease 19 (Covid-19) in Malaysia, March 2021 marked one year since the first MCO was enforced on March 18, 2020, ushering in a new standard. Unlike MCO 1.0, when most economical operations and national and interstate borders were closed, most states were in Recovery MCO in March this year, while few others, including Selangor, Johor, Kelantan, W.P. Kuala Lumpur, and Pulau Pinang, were in Conditional MCO commencing on March 2, 2021.

Despite the various stages of MCO being implemented around the country, economic activity was allowed to continue to operate under rigorous Standard Operating Procedures (SOP). Preschools and primary schools have been reopening since March 2021, allowing education-

related companies such as school canteens and bus services to resume as well. Furthermore, social events like wedding receptions, reunions, and meetings were permitted with restrictions depending on the size of the venue and the MCO's staging. As a result, the labour force situation in March 2021 continued to improve month over month, with a gain in employment and a smaller decline in unemployment.

In March 2021, short-term economic indicators showed that both exports and imports, as well as the trade surplus, continued to expand in double digits, with 19.8%, 15.9%, and 35.1 per cent growth, respectively.

With the return of most commercial activities and the introduction of the Covid-19 immunization campaign to a larger community, further recovery in Malaysia's labour force may be more certain. This good momentum, however, will be hampered by concerns about the country's health and, as a result, its economic performance.

The March 2021 Labour Force Report analyses the labour supply situation as the country enters the thirteenth month of various MCO phases. The study will go into greater detail about the month-to-month changes in order to look at the MCO's immediate effects on Covid-19 containment. Because the monthly figures are not seasonally adjusted, users should use caution when interpreting them. In addition, annual changes from the previous year's same month are noted. Figure 2.2 provides additional information:

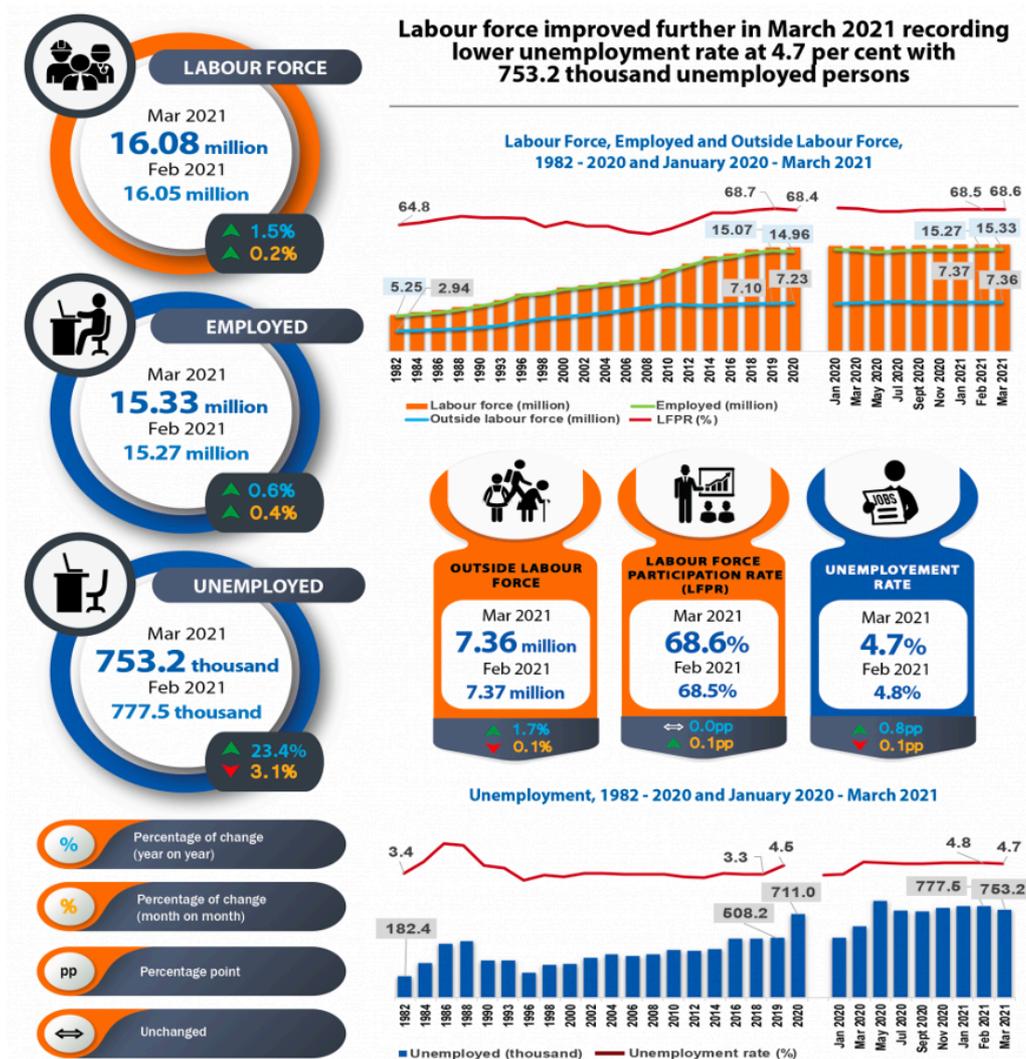


Figure 2.2: Labour Force Improved Further in March 2020 Recording Lower Unemployment Rate at 4.7 Percent with 753.2 thousand Unemployed Persons (Source: Department of Statistics Malaysia, 2021)

2.7.4 Unemployment Rate Showed an Improvement during the Month (Category, Duration, Age, and Training)

The number of actively jobless people, defined as those who were available for employment and actively looking for work, fell by 20.5 thousand people (3.2 per cent) to 626.9 thousand people (February 2021: 647.4 thousand persons). Figure 2.3 shows that more than half of the actively jobless people (51.1%) had been unemployed for less than three months, while 10.9 per cent had been unemployed for more than a year.

Similarly, the number of inactively jobless people who believed there were no job openings fell by 3.0%, or 3.9 thousand people, to 126.3 thousand people (February 2021: 130.1 thousand persons).

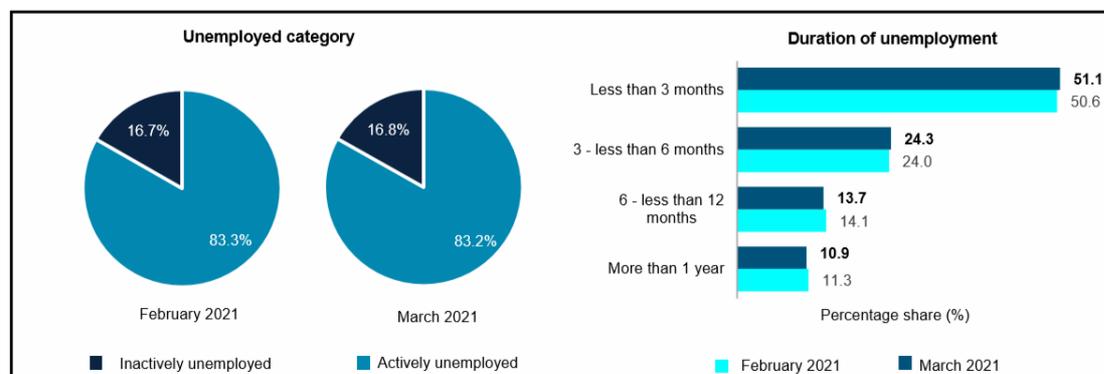


Figure 2.3: Unemployed Category and Duration of Unemployment, February and March 2021
(Source: Department of Statistics Malaysia, 2021)

The youth unemployment rate for individuals aged 15 to 24 years declined by 0.5 percentage points to 13.4 per cent in March 2021, down from 13.5 per cent the month before. In February 2021, the number of jobless adolescents fell to 321.1 thousand (-26.5 thousand), down from 347.6 thousand the previous month. The young unemployment rate for individuals aged 15 to 30 years, on the other hand, increased by 0.1 percentage points from February 2021 to 9.3 per cent, as illustrated in Figure 2.4.

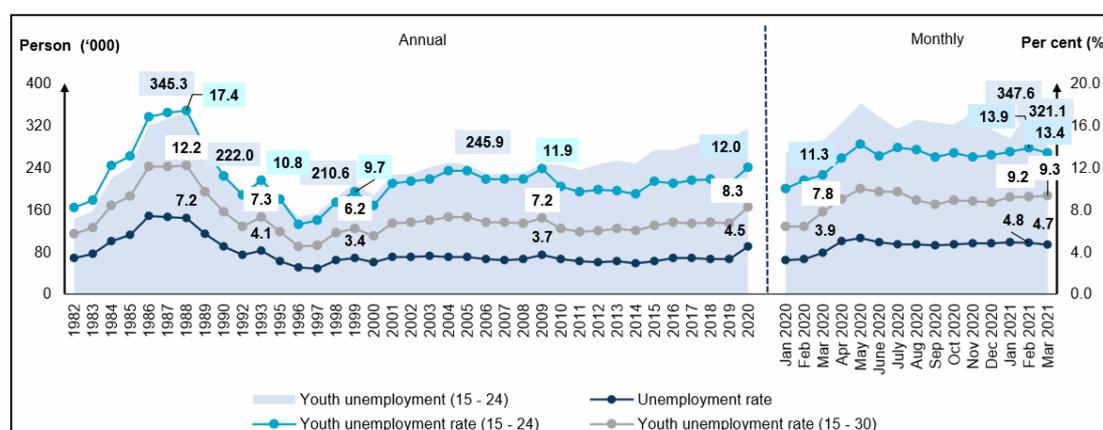


Figure 2.4: Unemployment Rate by Selected Age Groups 1982-2020 and January 2020-March 2021
(Source: Department of Statistics Malaysia, 2021)

Employees increased by 76.8 thousand people, or 0.6 per cent, to a total of 11.95 million people in March (February 2021: 11.87 million persons). This group accounted for the biggest percentage of employed people, with 77.9%. A similar trend was found among own-account workers, who climbed by 48.3 thousand people to register 2.48 million people in March, as shown in Figure 2.5. (February 2021: 2.43 million people).

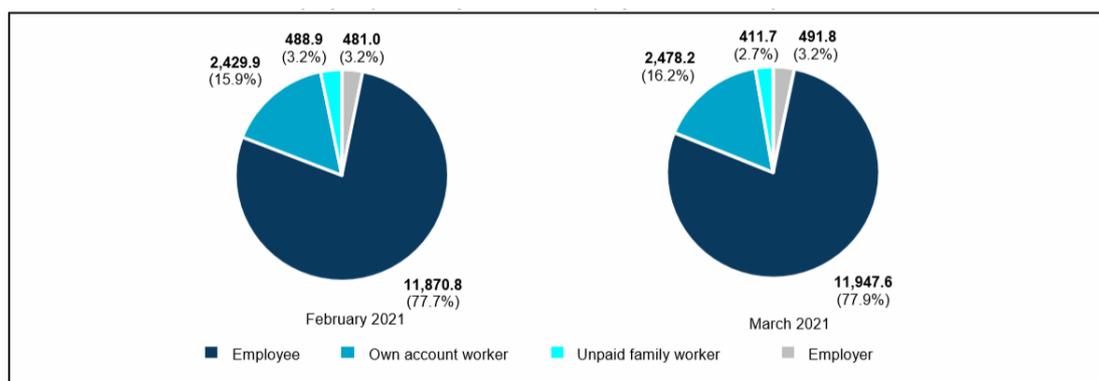


Figure 2.5: Employed Person by Status of Employment, February and March 2021
(Source: Department of Statistics Malaysia, 2021)

In March 2021, the number of individuals working outside the home decreased by 7,600, bringing the total number of people working outside the home to 7.36 million (February 2021: 7.37 million persons). However, year over year, this number climbed by 1.7 per cent (+124.0 thousand persons). Schooling/training accounted for 44.9 per cent of the outside labour force (3.31 million persons), as shown in Figure 2.6, followed by housework/family obligations (40.2 per cent or 2.96 million people).

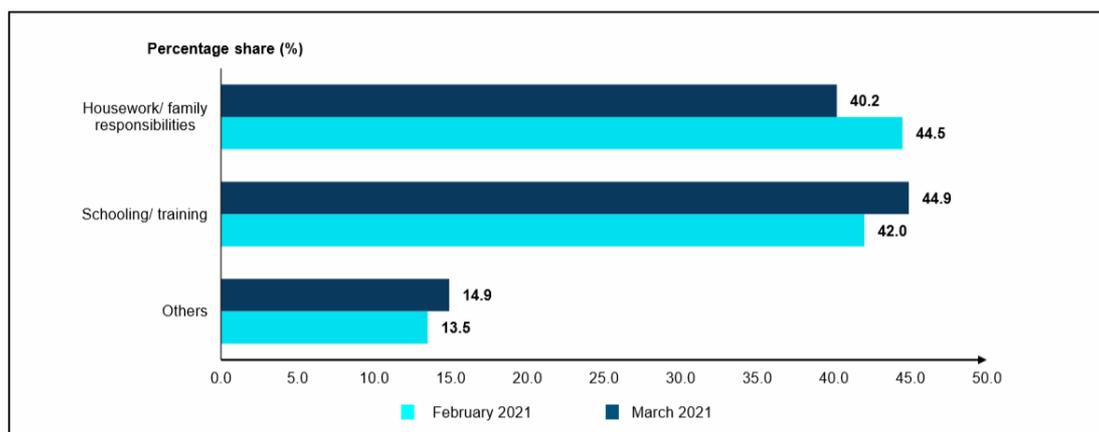


Figure 2.6: Share of Outside Labour Force by Reasons for not seeking Work, February and March 2021
(Source: Department of Statistics Malaysia, 2021)

The overall value of finished construction work in the first quarter of 2021 increased by -10.5 per cent year on year (Q4 2020: -14.2%), totalling RM31.4 billion (Q4 2020: RM31.7 billion). The Special trading activities sub-sector rose by 38.0 per cent in the first quarter of 2021. The other three sub-sectors, namely Residential buildings, Non-residential buildings, and Civil engineering, each experienced growth of -4.2 per cent, -5.3 per cent, and -22.3 per cent, respectively, as compared to the same quarter in 2020. The civil engineering subsector has led the value of construction work done since the fourth quarter of 2015, accounting for 39.0 per cent of the total, according to the Malaysian Department of Statistics. Non-residential buildings (27.4%), residential buildings (25.8%), and special trades activities (7.7 per cent) were the next three categories (7.7 per cent). The private sector continues to lead construction activity, accounting for 55.2 per cent of total construction work completed, or RM17.3 billion, versus 44.8 per cent for the public sector (RM14.0 billion). Additional information can be found in Figure 2.7.

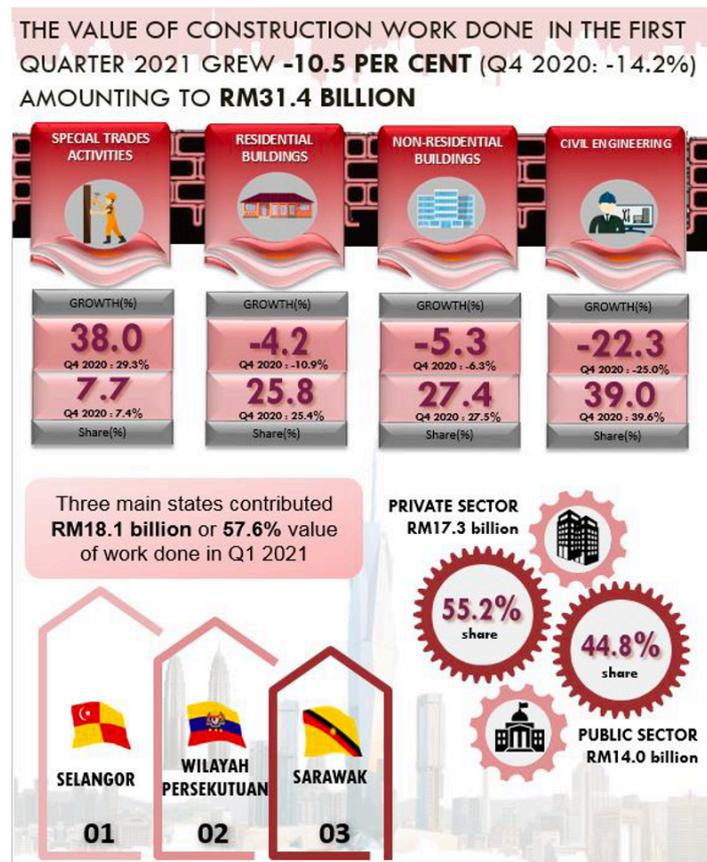


Figure 2.7: Quarterly Construction Statistics, First Quarter 2021
(Source: Department of Statistics Malaysia, 2021)

2.6.6 Government Initiatives

Under PRIHATIN and PENJANA, a total of 322,177 employers and 2.64 million registered employees had been assisted as of the Wage Subsidy Programme (PSU) 1.0's closing date on 26th February 2021. PSU 1.0 had attained a total value of RM12.84 billion in accepted wage subsidy applications as of 12th March 2021. Meanwhile, 72,531 employers have received a total of RM1.09 billion under PSU 2.0, allowing them to continue functioning and employing 619,821 people. Furthermore, 137,075 people were permitted to engage in courses given by several ministries and government agencies through the Reskilling and Upskilling Programme. To help workers who have lost their jobs, the Employment Insurance System under the Social Security Organization (SOCSO) provided RM85.96 million in financial assistance, including an increase in Job Seeker Allowance as announced in the Budget 2021 to over 18,000 workers who had lost their jobs as of 14th March 2021. Furthermore, as of 15th March 2021, a total of 2,586 health workers, including Science Officers, Diagnostic Radiologists, Medical Laboratory Technologists, Assistant Environmental Health Officers, Assistant Medical Officers, and Nurses, had been hired to strengthen the public health system in order to contain the Covid-19 pandemic, as well as 3,591 contract health workers to meet immediate needs.

As of 13th March 2021, a total of 7,205 loan applications totalling RM1.36 billion had been granted under the PENJANA SME Financing programme. As of 12th March 2021, local banks had accepted a total of RM11.75 billion in SMEs Soft Loans applications, benefiting 24,819 SMEs through the Special Relief Facility (SRF), Automation & Digitalization Facility (ADF), All-Economic Sector Facility (AES), and Agrofood Facility (AF) funds. Furthermore, a total sum of RM193.1 million was granted to 670 SMEs under the Bumiputera Relief Financing (BRF), which was specifically intended for Bumiputera SMEs who were harmed by the Covid-19. In addition, a total of 9,400 Agricultural Micro SMEs were supported with RM107.23 million in Agrobank Micro-Credit Financing to boost the Agriculture and Food Industry.

As a result, a continuous resumption of economic activity, together with different government actions to reduce the burden on people, businesses, and the economy, may lead to the labour market recovery getting back on track, thereby enhancing the labour market momentum.

2.7 NOSS Relevant to MSIC 2008 Section F, Division 42

As of 24th June 2021, the Department of Skills Development had developed 30 NOSS pertaining to Division 42. Table 2.9 below summarizes the NOSS titles.

Table 2.9: Summary of NOSS Developed Under Division 42

(Source: NOSS Registry updated 24th June 2021)

MSIC GROUP	CORRESPONDING NOSS/LEVEL
421 CONSTRUCTION OF ROADS AND RAILWAYS	1) BC-048-1 (2013) Grouting Supervisor 2) BC-048-2 (2013) Grouting Foreman 3) BC-048-3 (2013) Grouting Supervisor 4) BC-049-1 (2013) Assistant Tunnel Technician 5) BC-049-2 (2013) Tunnel Technician 6) BC-049-3 (2013) Tunnel Supervisor 7) BC-063-2 (2015) Road Construction Operation 8) BC-063-3 (2015) Road Construction & Maintenance Supervision 9) BC-065-3 (2014) Tunnel Construction & Operation 10) TP-700-2 (2014) Permanent Way Inspection 11) TP-700-3 (2014) Permanent Way Supervision 12) F421-001-4 (2020) Permanent Way Administration 13) F421-001-5 (2020) Permanent Way Management
422 CONSTRUCTION OF UTILITY PROJECTS	1) F422-001-2 (2018) Oil and Gas Pipe Fitting Operation 2) F422-001-3 (2018) Oil and Gas Pipe Fitting Supervision 3) BC-052-1/ FHG1 (2010) Pipeline Fitter I 4) BC-052-2/ FHG2 (2010) Pipeline Fitter II 5) BC-052-3 / FHG3 (2010) Pipeline Supervisor 6) SWC1 (2008) Sewerage C&S Installer 7) SWC2 (2008) Sewerage C&S Fitter 8) SWC3 (2008) Sewerage C&S Supervisor 9) SWM1 (2008) Sewerage M&E Installer 10) SWM2 (2008) Sewerage M&E Fitter 11) SWM3 (2008) Sewerage M&E Supervisor 12) F422-002-2: 2020 Assistant Pipe Jacking Operator

	13) F422-002-3:2020: Pipe Jacking Operator
	14) F422-003-3:2021: Pipe Jacking Shaft Construction Supervisor
	15) F422-003-2:2021: Pipe Jacking Shaft Construction Foreman
	16) F422-004-2:2021: Senior Drain Layer
	17) F422-004-1:2021: Drain Layer

2.8 Occupational Comparison Between Malaysia and Selected Countries

2.8.1 Indonesia

Figure 2.8 shows that the construction sector in Indonesia has a GDP of 10.71 per cent in 2020, ranking fourth among all industrial sectors. Indonesian President Joko Widodo has spent the last few years focusing on infrastructure development around the country in order to improve connectivity. As a result of the covid-19 epidemic, the number of construction establishments in Indonesia decreased by 3.26 per cent, from 168,000 projects in 2019 to 159,310 projects in 2020. Figures 2.9 and 2.10 clearly indicate the annual number and development of projects from 2012 to 2020.

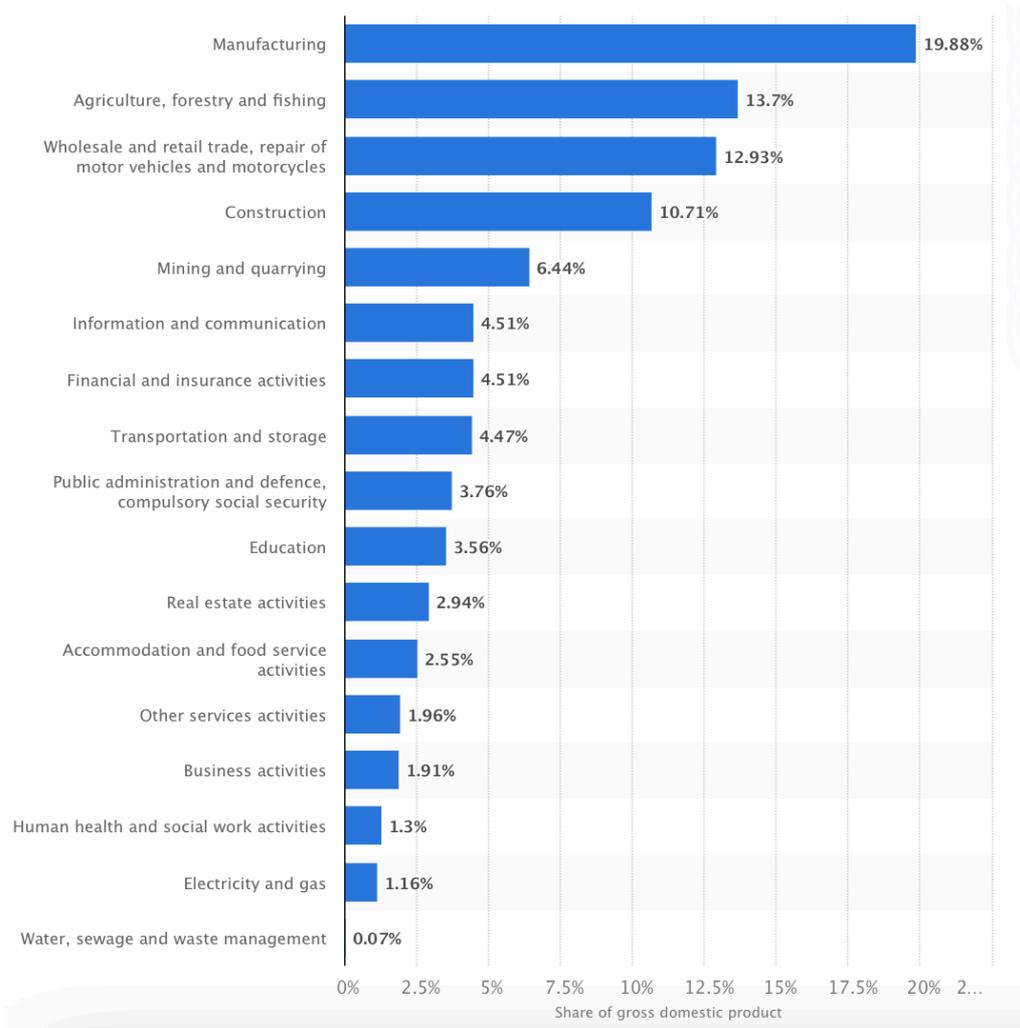


Figure 2.8: Contribution to a gross domestic product of Indonesia in 2020, by industry

(Source: <https://www.statista.com/statistics/1019099/indonesia-gdp-contribution-by-industry/>)

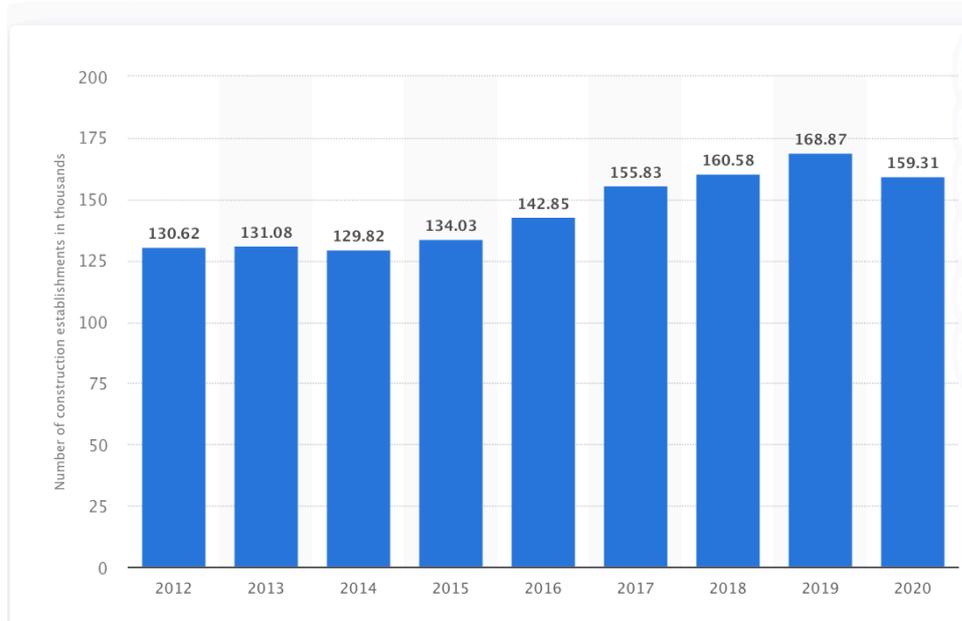
(in 1,000s)

Figure 2.9: Number of construction establishments in Indonesia from 2012 to 2020

In Indonesia, the construction industry employs about eight million people (Figure 4). Only 1.34 million of those were permanent workers, as Indonesian construction workers are typically engaged on a temporary or casual basis. Jakarta had the highest average daily wage for temporary construction workers in Indonesia, at slightly more than 150 thousand Indonesian rupiahs (US\$10.33). With the growing number of construction companies in Indonesia, it is projected that the number of workers will rise in lockstep.

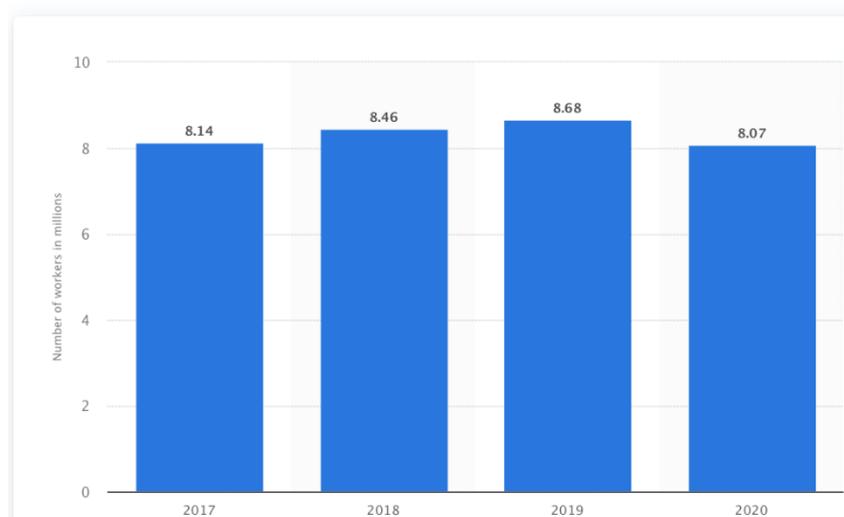
(in millions)

Figure 2.10: GDP growth rate for the construction sector in Indonesia from 2012 to 2020

Indonesia's infrastructure development has been focused on Java Island, which is home to the country's present capital city, Jakarta, as well as the majority of the country's population. The Indonesian government has recently begun to focus on developing the country's other islands. As part of a policy to decrease development disparities between Java and the other islands, President Joko Widodo declared in August 2019 that the capital city would be relocated to East Kalimantan. As a result, the difference between the total value of the finished building in Indonesian provinces is predicted to narrow.

2.8.2 Thailand

The GDP of the construction sector in Thailand ranks 10th and contributed approximately 425.2 billion Thai baht in the year 2020 (Figure 2.11 and Figure 2.12). In recent years, this value has also risen. Thailand's total GDP was roughly 15 trillion Thai baht in the same year.

(in billion Thai baht)

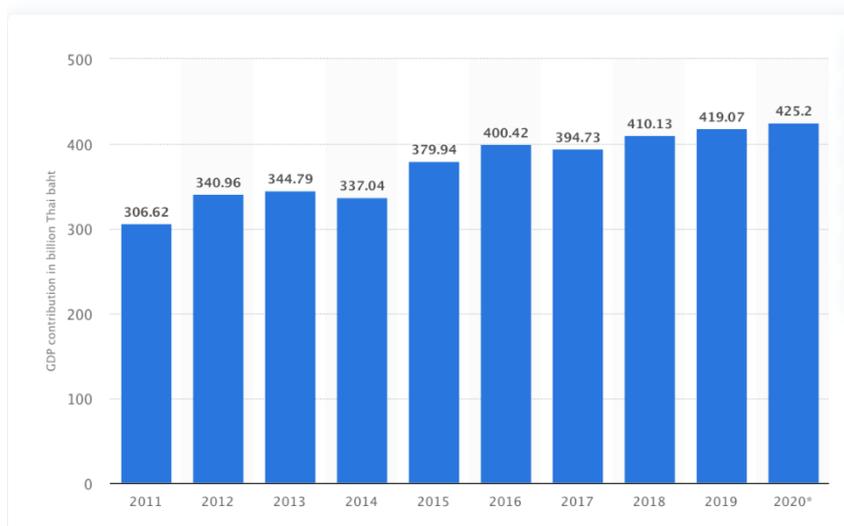


Figure 2.11: Gross domestic product (GDP) from the construction sector in Thailand from 2011 to 2020

(in trillion Thai baht)

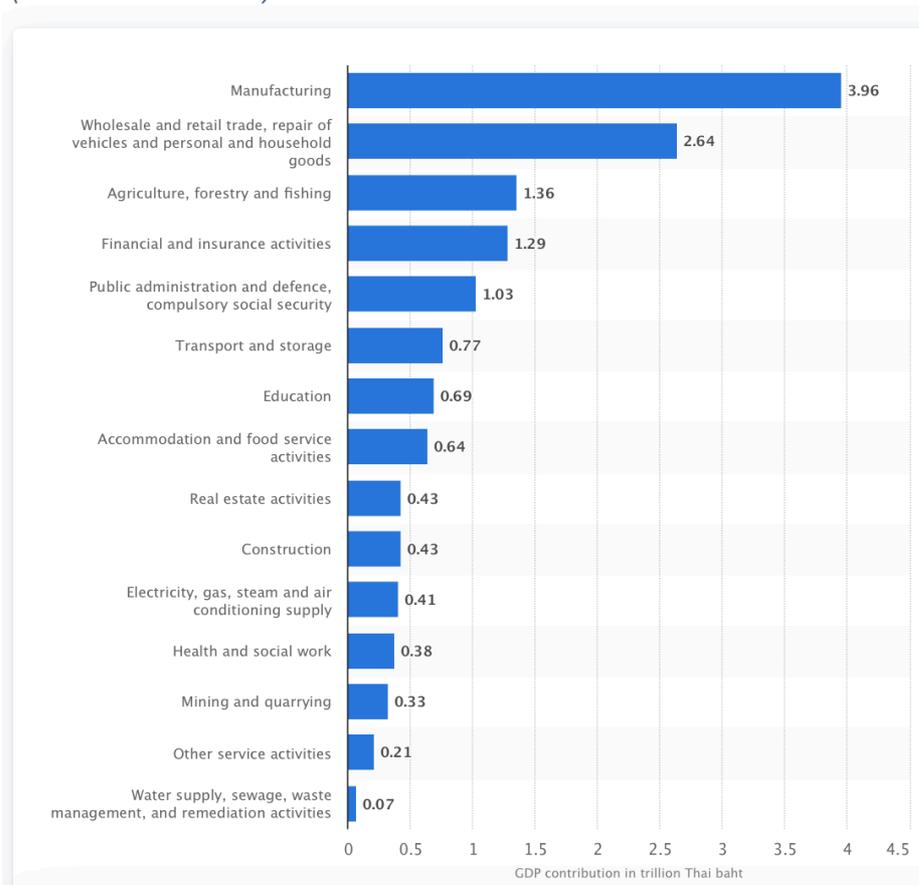


Figure 2.12: Gross domestic product (GDP) contribution in Thailand in 2020, by sector

In 2018, Thailand had around 80 thousand registered construction contractors, but only fifty-five of them played a significant role, accounting for around half of the revenue. From 2010 to 2020, Thailand's employment distribution by economic sector is depicted in Figure 2.13.

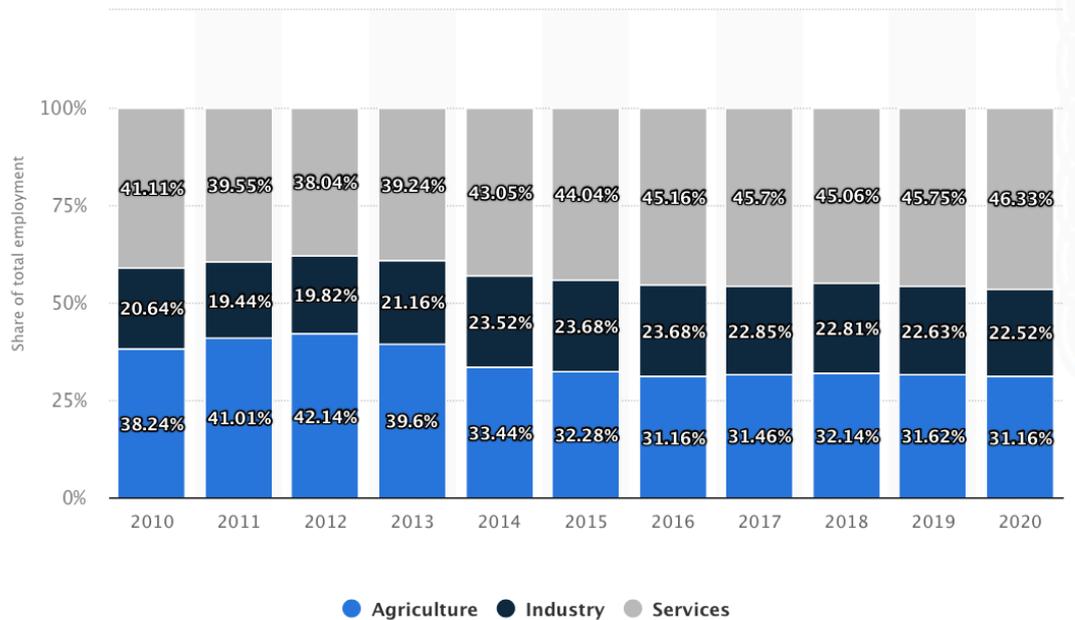


Figure 2.13: Thailand Distribution of employment by economic sector from 2010 to 2020

Thailand's construction industry is dominated by the state sector, which invests directly or collaboratively with private firms in public-benefit construction projects such as utility projects, schools, hospitals, and infrastructure for railways, bridges, and other buildings. The market value of public-sector construction projects in Thailand is expected to rise in 2020, despite the fact that Thailand's economy is currently struggling because of the Covid-19 outbreak.

Private-sector construction also makes a significant contribution to Thailand's construction industry. Residences, commercial structures, and industrial factories are among the private sector construction projects in the country. In Thailand alone, over three thousand new factories were constructed in 2019. However, unlike public-sector development, the market value of private-sector construction is expected to fall in 2020 as compared to the previous year.

2.8.3 United Kingdom

The United Kingdom (UK) market size, measured by revenue, of the Civil Engineering Project Construction industry, is £34.1bn in 2021. The market size of the Civil Engineering Project Construction industry is expected to decline by -16.4% in 2021, as shown in Figure 2.14.

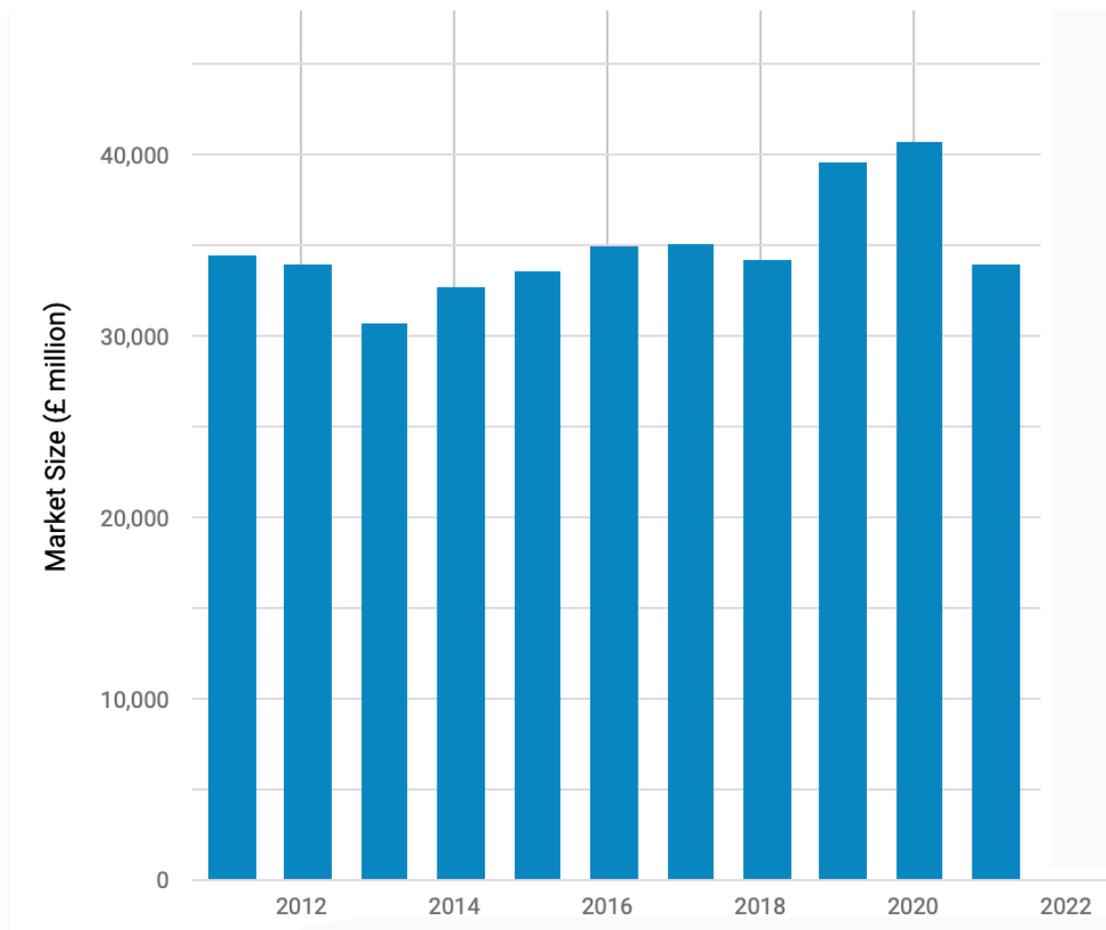


Figure 2.14: Civil Engineering Project Construction in the UK - Market Size 2010–2018

From 2010 to 2018, the number of employees working in the civil engineering industry in the United Kingdom (UK) fluctuated (Figure 2.15). The industry employed 193,788 people in 2015. By 2018, the population had risen to 244,945 people. In the same year, the total number of workers employed in the construction industry in the United Kingdom was estimated to be over 1.4 million. Figure 2.16 depicts the civil engineering industry's annual turnover in the United Kingdom (UK), ranging from 40 to 70 million euros.

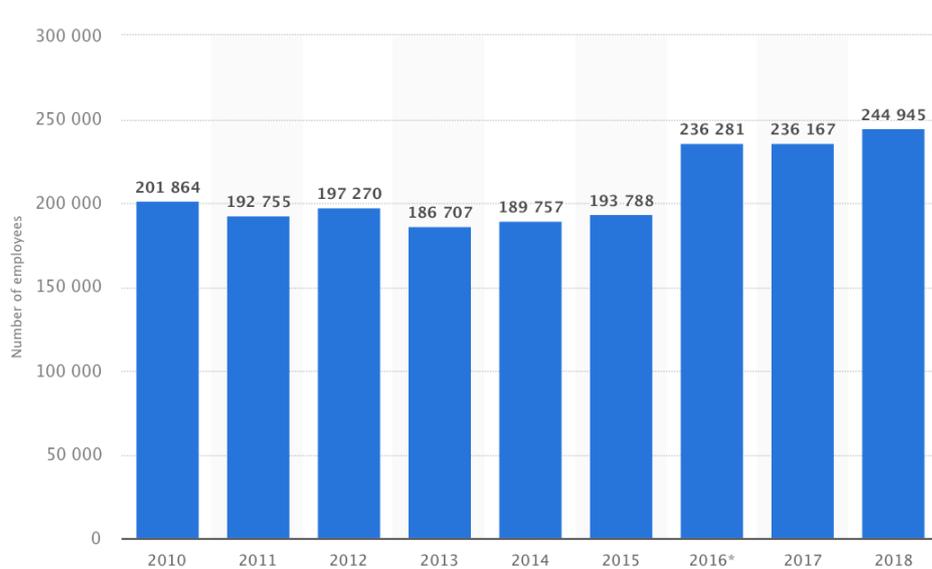


Figure 2.15: Total number of employees in the civil engineering industry in the United Kingdom (UK) from 2010 to 2018

(in million euros)

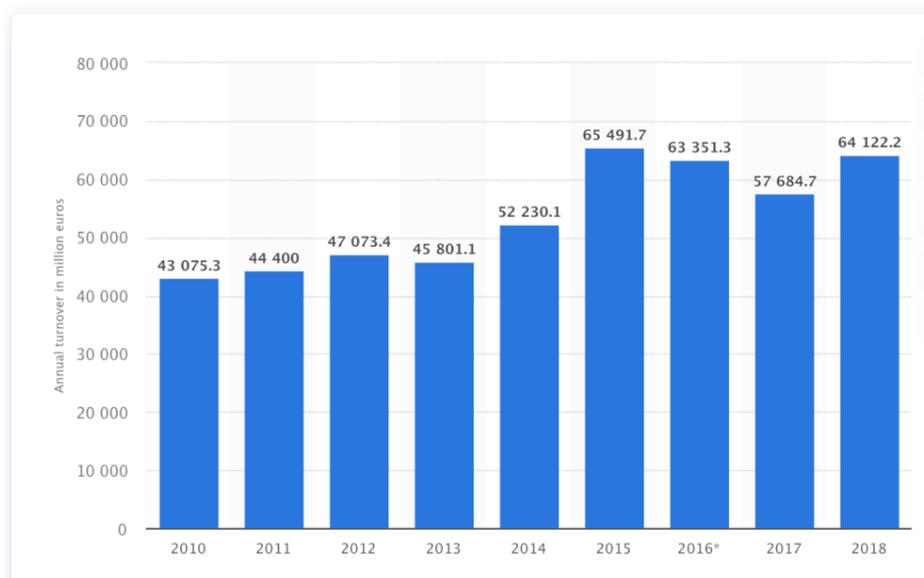


Figure 2.16: Annual turnover of the civil engineering industry in the United Kingdom (UK) from 2010 to 2018

When compared to the scenario in Malaysia, the construction industry has moved quickly to keep up with the times as it strives to achieve considerable economic growth and chart a path to the Vision of Shared Prosperity in 2030. One of the most important areas for countries to build their economies and hence, will boost their competitiveness in the construction industry. The construction sector, on the other hand, adds to the high accident mortality rate, which is

consistent with the economy's favourable growth. Malaysia's construction industry will employ around 1.4 million people by 2020.

2.8.4 Singapore

Figure 2.17 shows that the construction sector in Singapore has a GDP small of 2.7% per cent in 2020, ranking last five among all industrial sectors. The manufacturing sector contributed the highest with 21.5 per cent to Singapore's nominal gross domestic product (GDP). Singapore's real GDP contracted by more than five per cent in that year owing to the COVID-19 pandemic. While this sector was badly hit by the COVID-19 pandemic in 2020, the Building and Construction Authority of Singapore (BCA) projected that total construction demand would grow in 2021. Although the industry has yet to bounce back to pre-pandemic levels, several major public sector projects were expected to spur growth and recovery in the years to come.

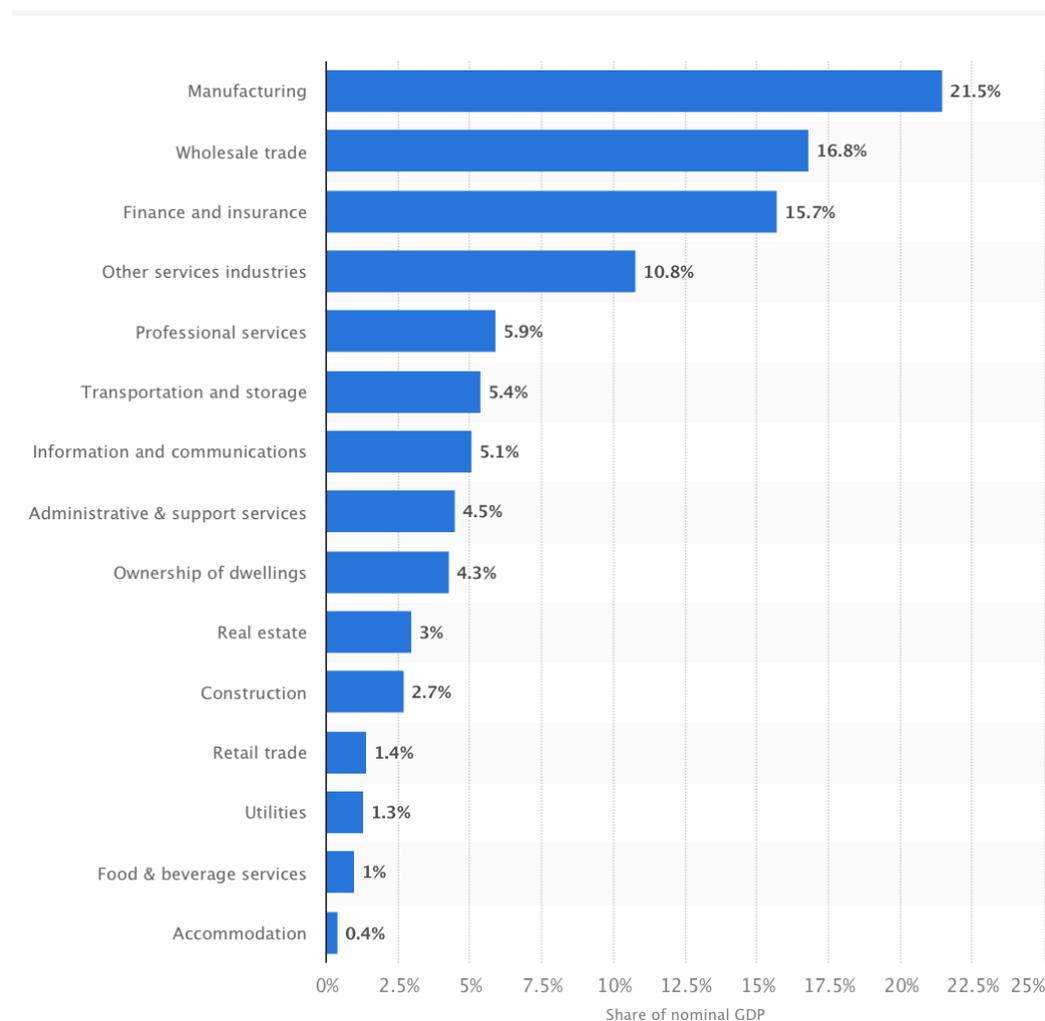


Figure 2.17: Nominal GDP Breakdown Singapore 2020, by Sector

(Source <https://www.statista.com/statistics/1122999/singapore-nominal-gdp-breakdown-by-sector/>)

The construction sector in Singapore contracted by 35.9 per cent in 2020, as shown in Figure 2.18. The COVID-19 pandemic had a negative impact on the construction sector, as movement restrictions introduced to curb the spread of the virus led to a temporary halt in construction work, among other factors.

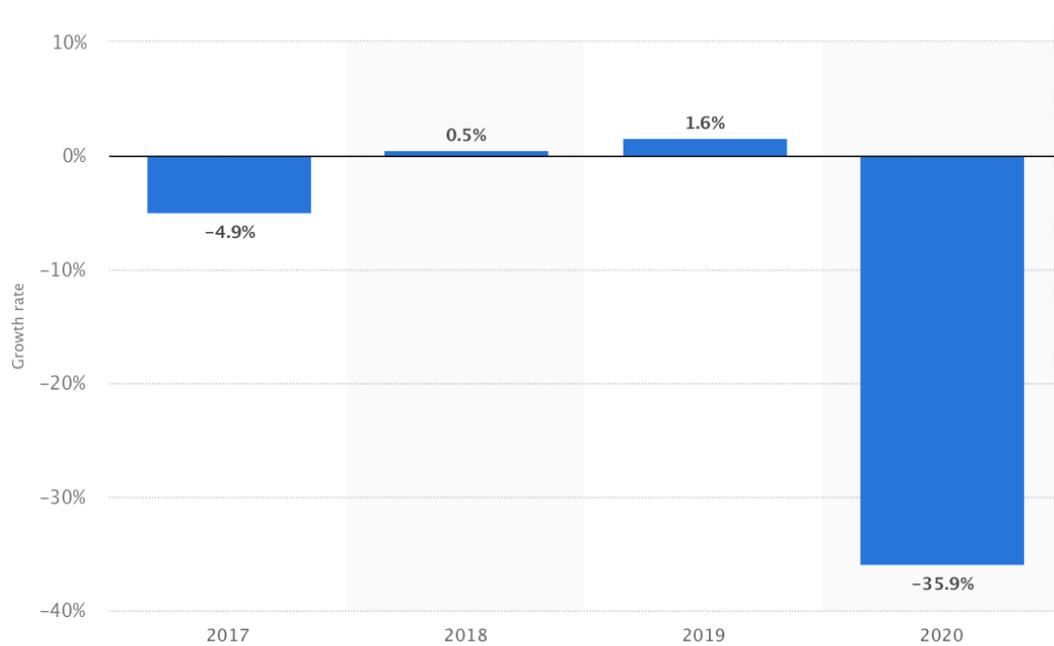


Figure 2.18: FGDP Growth Rate for the Construction Sector in Singapore from 2017 to 2020

The construction industry is, however, expected to improve, spurred by the public sector. Singapore's largest road project, the North-South Corridor, is already in the works and is set to be completed by 2026. Further boosting construction demand are its ambitious civil engineering projects, such as the expansion of the rail network through the Johor Bahru – Singapore Rapid Transit System (RTS); the building of the 62km-long Coast-to-Coast (C2C) Southern Trail, a cross-island cycling and walking path; and the construction of the Integrated Transport Hub at Jurong East. With all these developments in the works, the BCA has projected for public sector contracts awarded to be between 23 to 28 billion Singapore dollars in 2021. Figure 2.19 illustrates the construction growth of Singapore in 2020.

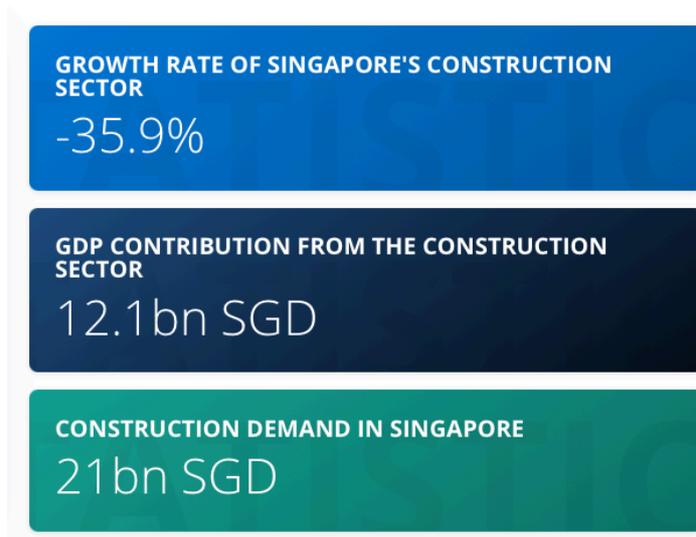


Figure 2.19: Construction Growth of Singapore in 2020

The pandemic has also resulted in a labour shortage for the construction sector. Singapore's construction sector is heavily reliant on foreign labour, the majority of whom come from neighbouring Asian countries such as Bangladesh, India, and Myanmar. The restrictions on travel, coupled with the ongoing COVID-19 crisis in these markets, resulted in a shortage of labour in construction.

The COVID-19 pandemic has also decreased productivity in construction. Safe distancing measures implemented during the pandemic have led to a decrease in labourers working on a construction site at a given time. Construction work was also halted for four months in 2020, as Singapore tried to contain an outbreak of COVID-19 among its migrant worker community, the majority of whom were employed as construction labourers. To prevent such an outbreak from happening again, Singapore has started offering vaccines to its migrant workers.

In 2020, the construction industry in Singapore employed around 97.2 thousand residents. The construction industry has seen a contraction in the past few years, and the decline in 2020 could indicate a correlation to the COVID-19 pandemic.

As of December 2020, 311 thousand foreigners were employed in the construction and marine shipyard and process industry. Singapore's construction sector relied heavily on migrant labour, the majority of whom come from neighbouring Asian countries such as Bangladesh, India, and Myanmar. Many experienced several challenges in Singapore, including harsh working and living conditions, discrimination, as well as health risks.

2.9 Relation of Industry Revolution and Green Technology with Occupation

Steam power in the nineteenth century, electricity in the early twentieth century and automation in the 1970s all had an impact on industrial productivity. There was no general decrease in employment as a result of these technological advances. Malaysia's low productivity growth was a source of concern in 2018, and according to the MPC's 25th Productivity Report 2018/2018, Malaysia's productivity growth was more or less flat in 2018, increasing by 0.1 percentage points from 3.7 per cent in 2014 to 3.8 per cent in 2017, after dipping to 3.5 per cent in 2015 and 2016. On May 8, 2017, former Prime Minister Datuk Seri Najib Tun Razak unveiled the Malaysian Productivity Blueprint. According to the Eleventh Malaysia Plan (2016–2020), Malaysia must achieve a minimum of 3.7 per cent labour productivity increase by 2020.

In the early stages of IR4.0 implementation in Malaysia, the government is dedicated to moving away from reliance on low-skilled/foreign employees, notably in the manufacturing sector. Adopting new technologies to make businesses more efficient and productive will follow global trends. Cheap labour, as a result of the arrangements, is unsustainable in the long run and prone to human errors, lowering the quality of the items produced. In this type of business, implementing Industry 4.0 will boost efficiency and encourage zero-defect outputs. The nature of the industry in civil engineering construction differs from that of manufacturing.

Although automation has increased the number of construction jobs, it has also opened up new opportunities and boosted the demand for new skills. Another shift in the labour market is on the horizon as construction enters the fourth wave of technological advancement: the introduction of new digital industrial technologies collectively known as the Industrial Revolution 4.0. (IR4.0). Table 2.10 shows the nine critical pillars of IR4.0 outlined by the MITI.

Table 2.10: The 9 Pillars of Industrial Revolution 4.0**(Source: Ministry of International Trade and Industry, 2017)**

No.	Industrial Revolution 4.0 Pillars	Description
1)	Autonomous Robots	Coordinated and automated actions of robots to complete tasks intelligently, with minimal human input.
2)	Big Data Analysis	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 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 mobile devices -

		providing 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 optimise 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.

Despite the fact that the construction industry is massive and has a significant impact on other industries, it still relies significantly on physical labour and mechanical technologies. As a result, productivity has ground to a halt.

Digital technologies have just lately begun to penetrate the industry, gradually altering the way infrastructures are built and constructed. Prefabrication and modular construction, advanced building materials, 3D printing and additive manufacturing, autonomous construction, augmented reality and virtualisation, big data and predictive analytics, wireless monitoring and connected equipment, cloud computing and real-time collaboration, 3D scanning and photogrammetry, and building information modelling are all examples of technologies that are having a significant impact on the construction industry. Given that construction accounts for 6% of global GDP, their economic and societal effects could be enormous.

Green technology is a type of technology that is friendly to the environment and prevents pollution that is harmful to human health and living organisms. This technology gives alternate energy sources and resources to those that are harmful to the environment. Buyers should also be aware that getting green advancements can help them save money on energy, and those green creations are frequently safer and more beneficial (Soni, 2015). If not properly planned, described, and performed, civil engineering projects can have significant site-specific and cumulative effects on our environmental and social systems (Saroop et al., 2012). Streets, water, sewage, and stormwater infrastructure components, for example, might result in the loss of basic biological processes and biodiversity. There is a need to develop an eco-friendly framework configuration rating system that encourages and promotes the use of "kinder" design arrangements. The evaluation of green structures evaluates the structures' environmental consequences, with less emphasis on the natural execution of structural building foundations.

Green technology can be used to build roads, parking lots, and other structures; low-volume streets can be made permeable, allowing rainwater to soak into the asphalt and then slowly drip into the groundwater. When an automobile moves through light rain, this will also wipe out a splatter of water. Precast solid asphalt is the most appropriate type of asphalt. The subbase and base layers for low-volume streets must be open-graded granular layers with high porosity. The quality of the granular layers can be improved with concrete or bitumen treatment for significant movement (Iravani. et al., 2017). Green technology has a number of advantages and disadvantages, including the fact that it (1) does not pollute the environment, (2) provides monetary benefits to specific zones, (3) requires less maintenance, (4) is sustainable (meaning it will never run out), and (5) helps to mitigate the effects of global warming by reducing CO₂ outflows.

2.10 Conclusion

Malaysia's construction industry is a major and important part of the country's economy. The construction sector grew 42.6 per cent in the second quarter of 2021 to RM28.2 billion, the highest growth recorded since the second quarter of 2012 due to the lower base in 2020. Certain NOSS titles in the 35 NOSS's group have remained unchanged, necessitating immediate action to bring the standard up to date. The findings of the industry setting, the MSIC 2008 definition of the employment area, and the produced NOSS are all highlighted in this chapter, all of which contribute to a better knowledge of the overall picture of the sector. These inputs lead to the following steps in reorganising the occupational structure, such as identifying suitable JT and in-demand skills. The applications of IR4.0 will have an impact on this industry's personnel in the future. Specific research methodologies are used to achieve the aforementioned goals. The research methodology and approaches are discussed in the following chapter.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This section gives an overview of the overall research design, strategies for data collection and data analysis procedures performed to meet the objective of the study. In developing a better comprehension of the current development of civil engineering in Malaysia, this study uses multiple data collection approaches. Besides document analysis, mixed-method research that involves quantitative and qualitative approaches are employed. The quantitative approach is embedded by using a survey questionnaire, while the qualitative approach is based on document analysis and FGD with industry experts.

3.2 Research Design

This study applies mixed-method research focusing on document analysis, interviews, and cross-sectional surveys. A Research Onion by Saunders, Lewis & Thornhill (2015) is adapted to illustrate the research design for the study. Research onion is commonly used by business students and in the field of business. However, due to the clarity of the diagram, which is represented in layers in explaining the design of research moving from macro to micro aspects of research, the researcher adopted this concept and applied this design to explain the study. The research onion has six layers, from outer to inner: philosophy, methodology, strategy, decision, time horizon, and methodologies and processes. The research onion is formed by the outer layers, while the middle layers are the research building pieces. The boundaries within which the methodologies and procedures for data gathering and data analysis should be selected are determined by the researcher's comprehension of the onion's outer layers. The research design is depicted in Figure 3.1, and the elaboration for each layer is provided in the subsections that follow.

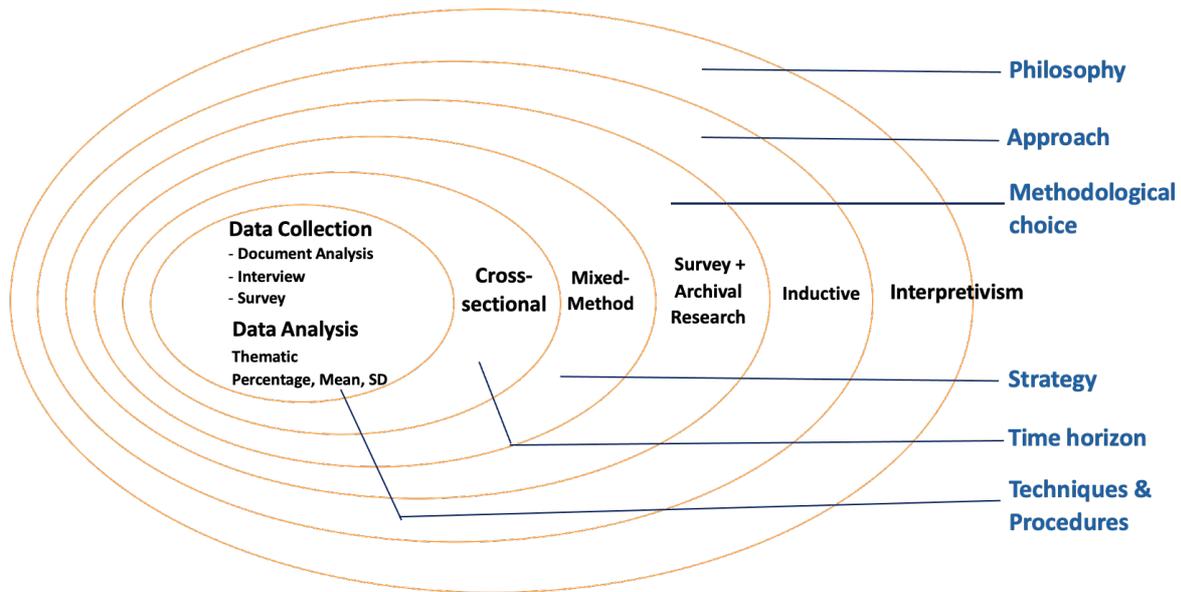


Figure 3.1: Research Design for the Study
(Source: Adapted from Saunders, Lewis & Thornhill, 2015)

3.2.1 Philosophy

A system of beliefs and assumptions regarding the generation of knowledge is referred to as research philosophy (Saunders, Lewis & Thornhill, 2016). This includes assumptions about the research's facts (ontological assumptions), assumptions about human understanding (epistemological assumptions), and how the researcher's values influence the research process (axiological assumptions). Different ways of looking at social reality, diverse means of constructing it, and different ways of interpreting it exists in social science. The philosophy of interpretivism underpins this research.

Realities are apprehended in the form of various intangible mental constructions, socially and experientially based, local and specific in nature, and dependent for their shape and content on the individual persons or groups holding the constructions, according to interpretivism (Guba & Lincoln, 1994, p. 110). Interpretivism contends that humans are distinct from physical occurrences in that they construct meaning; as a result, this paradigm emphasises complexity, richness, various interpretations, and meaning creation (Saunders, Lewis & Thornhill, 2016). The epistemological assumptions of interpretivism are transactional and subjectivist. This paradigm posits that the researcher and those involved in the research are linked in a way that allows the discoveries to be made and the research process to continue. The researcher's

interpretation of research materials and data, as well as her attitudes and beliefs, are significant in the research process, according to the interpretivist philosophical perspective.

The interpretivist paradigm is used by the researcher in this study to view social reality. A paradigm is defined as a style of thinking about and making sense of the real world's complexities (Patton, 2015). The research participants in this study originate from various geographical locations, backgrounds, settings, and environments and hence generate and experience distinct realities at different times. The goal of interpretivist research, which is based on the application of the MSIC 2008 in Malaysia, is to produce new, in-depth, and richer understandings and interpretations of the phenomena being studied by adopting this paradigm.

3.2.2 Approach

This research will take an inductive approach to reason. The data is used in an inductive way to uncover theoretical possibilities or categories, with the goal of developing theory (Meyer & Ward, 2014). In an inductive approach, the researcher collects information and data, asks questions about the phenomenon, classifies and categorises the data, looks for patterns in the data and proposes potential theories, theories are tested and developed, and patterns are compared to other patterns and theories. Without making any assumptions or prescribing what those dimensions will be, the inductive technique permits meaningful dimensions to arise from the patterns identified in the data under examination (Patton, 2015). This method entails the creation of a theory as a result of empirical data observation (Saunders, Lewis & Thornhill, 2016). The purpose of data collecting is to investigate a phenomenon, find themes and patterns in order to design F42.

3.2.3 Methodological Choice

The study's methodological choice is provided by the third layer of the research onion. To address the nature of the research problem, this study will use a hybrid methodological approach. Furthermore, this methodology is utilised to gain a firsthand understanding of the participants' perspectives in order to produce useful data (Yin, 2018). The goal of this study is evaluative in nature. The method allows the researcher to communicate directly with the research participants and respondents, as well as the setting and phenomenon under investigation. It necessitates the researcher's interpretation of data from a variety of sources and approaches in order to uncover substantively significant patterns and themes for the

phenomenon under investigation. As a result, the researcher must be adaptable and receptive to whatever occurs during the research process, as well as reflective and reflexive of their own thoughts and voices.

3.2.4 Strategy

The following layer of the onion focuses on research strategy options. A research strategy is a methodological relationship between the study's philosophy and the procedures used to collect and analyse data (Denzin & Lincoln, 2011). A researcher's research strategy is a plan for how she will approach solving her research issue (Saunders, Lewis & Thornhill, 2016). A mixed technique approach was used to conduct this research.

3.2.5 Time Horizon

The temporal horizon that the researcher uses in her investigation is depicted in the adjacent layer before reaching the core of the research onion. This is a cross-sectional study that looks at a certain phenomenon in the specified industries at a specific time. This is consistent with the choice of a research strategy that can be completed in a short amount of time.

3.3 Research Approach

The research approach in this study involves a variety of instruments, techniques, procedures, and processes to collect data and information from participants and respondents.

3.3.1 Data Collection Techniques and Instrumentation

The data for this study was gathered from a variety of sources, including document analysis, interviews, and a survey. These three data collection approaches are used to "provide an in-depth picture of the situation" (Creswell & Poth, 2018, p.162). If the data from the various sources give comparable results, the data will be triangulated to contrast and validate it (Leavy, 2017).

3.3.2 Document Analysis

Document analysis is concerned with the availability of reviewing public material from sources such as websites, archives, and other written reports to acquire actual secondary data. To gain a better understanding of the sector and fulfil the research objective, the researcher employs document analysis to evaluate the work of not only other researchers but also professionals

through trade reports, the Internet, and articles. This method provides an overview of the industry that is important to IR4.0 and industrial requirements.

There are two main sources for data collection in document analysis, namely (1) Economic Database and (2) Database from Other Agencies (such as Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC) and DSD). In Economic Database, the researcher gathers some Labour-related data that is extremely significant to this research. Information requested from DOSM is (1) the provision of an overview of the existing and future state of the specific construction activities industry, and (2) the baseline database and control figures when analysing data from an online survey. While in Database from Other Agencies such as *Rancangan Malaysia Ke-11* (RMK11), DSD, and Others, the importance of economic database from various agencies (both local and international) are gathered and examined. The following database, based on the research's initial observation, comprised industry-relevant data are (1) Local database, namely DSD, MITI, mid-term review of RMK11, Budget and MIDA; and (2) International database, namely Organization for Economic Co-operation and Development (OECD), World Bank, European Union (EU) and Economic Monitor.

Database in the form of online resources and published reports are collected from local and international agencies. The following data analysis procedures are carried out based on the two groups of databases: (1) examine the industry's economic performance by looking at several macroeconomic indicators (such as GDP, employment, and output), (2) analyse the industry outlook in relation to regional and global perspectives, (3) determine the current and future workforce profile (such as occupations), and (4) review technological development in the industry (such as robotic and automation as well as elements of IR4.0).

3.3.3 Interview

Interview is conducted in the manner of FGD, where respondents from industry experts and practitioners are chosen. The interview protocol is in the form of semi-structured questions adapted from Division 43: Specialized Construction Activities (see Annex 6).

Industry engagement based on FGD is conducted to enable in-depth discussions on the issues of the industry workforce. Two series of FGD are conducted. Initially, the FGD discusses on the OS, OD, assessment of curriculum and training programmes; accreditation and qualification based on NOSS and MQA framework; potential workforce challenges; outlook and strategic recommendations to be proposed. From these two series of FGD and the derive themes, a survey questionnaire is designed based on the industrial feedbacks and analyses.

Thirteen industry experts are appointed for the FGD, which is managed by a facilitator to foster interaction among the panel members while keeping the discussion under control. In terms of industry experts, they must have at least 7 years of experience in the linked field and have worked for an SSM-registered firm. The results of the FGD debate are recorded, transcribed and analysed by the researcher. In the first FGD meeting, semi-structured questions are utilised. It is designed on Occupational Standard (OSd) and OD construction based on four themes, namely CiD, jobs in demand, emerging skills and related issues. The identification of critical jobs in the specialised construction activities industry is also determined in the FGD. The second phase in FGD is for the verification and validation of the findings.

A (1) Participant Information Sheet (see Annex 3) and (2) Participant's Consent Form (see Annex 4) are given to all panellists at the first FGD session. For the purpose of confidentiality, the panellist name is not disclosed in any of the transcripts, reports, and any publication related to the study except at their own request is prioritised. FGD protocol is utilised in the FGD session.

In the process of gathering the input, the brainstorming technique is adopted in this FGD discussion. Industry experts on development panel members were present, and they discussed the many sub-sectors and sections of the industry. The information gathered during the document search is also discussed and provided to the members of the development panel. The data gathered is subsequently fed into the OF subsector as input. The second meeting with an existing FGD group is conducted after the data analysis result is obtained from the first FGD to enhance and confirm the saturation point of data in line with the items discussed in the FGD. The third FGD discusses the items designed in the survey questionnaire and, the final FGD highlights the findings of the overall result in the research.

3.3.4 Survey

The questionnaire for the survey is adapted from Division 41: Construction of Buildings (DSD, 2019) and Division 43: Specialized Construction Activities (DSD, 2019) and adopted based on the comments from the two sessions of FGD and the four major significant parts of CiD, OD, emerging skills, and connected challenges. In order to suit the requirement of the study based on MSIC2008 and its close relationship with Division 41 and 43, the adaptation of the instruments would engage the suitability of the requirement of the emerging OF that is being studied.

The questionnaire is constructed with close-ended questions on an interval scale appropriate to the instrument to maximise response rate and consistency. Face validity and content validity are used. Thirteen experts industries performed content validity checks throughout the inter-quartile rank to achieve consensus among experts. They are anticipated to identify the content, syntax, and sentence construction, as well as grasp the items applied in the questionnaire. A pilot test is administered to a minimum number of 30 respondents.

For this study, the sections of the questionnaire are divided into 5 parts. Part 1 concerning the CiD to measure the intensity of job demands against the supply of labour. Part 2 discusses jobs in demand to measure the shortage of manpower in civil engineering. Part 3 concerning the emerging skills to measure the important pre-requisites and skills for IR4.0 in civil engineering activities. Part 4 concerning the green technology in another new labour change horizons.

The 4-interval scale range is utilised to determine the levels of demands among respondents: 4 – High in Demand (HD), 3 – Mid in Demand (MD), 2 – Low in Demand (LD), and 1 – Not in Demand (ND). The Job Areas and Category of Skills pertaining to levels of demands are described in Table 3.1:

Table 3.1: Job Areas and Category of Skills

Category of Skills	Job Areas
Not in demand (ND)	Job seekers have a lesser of skills/job seekers have a lesser probability of finding work within an occupation.
Low in demand (LD)	Job seekers are less likely of skills/job seekers are less likely to find employment in the job.
Mid in demand (MD)	Job seekers have uncertain skills/job seekers have an uncertain probability of finding work within an occupation.
High in demand (HD)	Job seekers have a greater of skills/job seekers have a greater probability of finding work within an occupation.

Source : Demerouti et al., 2001

While Part 5 discusses issues pertaining to industry to measure key issues in the civil engineering industry. The 4-interval scale range is utilised to determine the levels of agreement among respondents: 1 – Strongly Agree (SA), 2 – Agree (A), 3 – Disagree (D), and 4 – Strongly Disagree (SD).

In this study, the 4 points Likert scale is employed, known as a forced Likert scale. The respondents are forced to form an opinion. There is no safe 'neutral' option utilised in the questionnaire.

This research uses self-administered and online surveys to investigate four important areas: CiD, in-demand jobs, emerging skills, and related issues (see Annex 7). The cross-sectional survey is administered using a Google form distributed to related organisations. The questionnaire is divided into five parts. They are: (1) Competencies in Demand - The competencies required by the industry are discussed in this section. Another objective of this

section is to identify the skills gap and how to close the gap of competencies in demand, (2) Jobs in Demand - This section aims to identify the categories of short supply or oversupply workers. According to MASCO, skilled employees, semi-skilled workers, and low-skilled workers are listed among these categories, (3) Emerging Skills - This section seeks to figure out whether industry participants and workers are equipped for IR4.0. The pillars of technological drivers of IR4.0 are listed, and respondents must determine if each feature is relevant in the line of duty, (4) Green Technology - This section investigates new opportunities and a greater demand for new skills in another new labour change horizons, and (5) Related Issues - This section investigates the industry's most typical problems. The respondents are asked to select whether the challenge is industry related.

The survey questionnaire instrument is validated by three expert panels from the civil engineering field concerning face and content validity (see Annex 8). The questionnaire is reliable for the study based on the Cronbach Alpha value administered in the pilot study.

3.4 Pilot Study

In this research, a pilot study has been carried out to test the reliability of the instruments. The reliability test was conducted to test the internal consistency of two adapted instruments by using the Cronbach Alpha coefficient. The purpose of this pilot study is to ensure the item in the questionnaire given to the respondents are easy to understand, especially the suitability of the term and the structure of the sentence so as not to cause confusion and misinterpretation, to familiarise researchers with a study before the actual research is carried out. A pilot study needs to be done to detect possible flaws in measurement procedures such as instructions or time limits and the operationalisation of independent variables (Welman & Kruger, 1999). Hair et al. (2010) suggested conducting a pilot study to check if the research questionnaire needed to be revised or improved.

The pilot study is conducted to explore the feasibility of the study and to gain some experience conducting a case study fieldwork. This is supported by Yin (2018) that the aim of conducting the pilot study is to assist the researcher in refining the data collection plans, improving the interview protocols and providing conceptual clarification for the research design. Yin (2018)

further states that the pilot case will allow the researcher to assume the role of a 'Laboratory in detailing the protocol, observing different phenomena from different angles and trying out different approaches in the field. In this study, the pilot study is administered to 30 respondents selected from G1-G3.

Gay (1996) and Kline (2011) recommend the minimum acceptable sample size is 30 respondents in a pilot study due to statistical analysis purposes. Connelly (2008) suggested sample size for the pilot study is 10% from the real sample. In this research, 377 respondents have been selected using stratified random sampling from Peninsula Malaysia, Sabah, Sarawak, and Labuan. Cronbach Alpha is used to measure the reliability of these research instruments. Nunnally and Bernstein (1994) recommended the Cronbach Alpha coefficient for reliability is 0.7. Leech, Barret and Morgan (2008) suggest similar reliability that is the reliability coefficient of 0.7 is considered acceptable. While George and Mallery (2001) suggest the rule of thumb in interpreting Cronbach Alpha value as follows:

$\alpha > .9$ =excellent

$\alpha > .8$ =good

$\alpha > .7$ =accepted

$\alpha > .6$ =questionable

$\alpha > .5$ =poor

$\alpha > .4$ =unacceptable

In this research, the Cronbach Alpha value at .7 and above is considered accepted. Table 3.2 shows the result of Cronbach Alpha Reliability for Competency in Demand, Job in Demand, Emerging Skills, Green Technology, and Related Issues:

Table 3.2: The Result of Reliability Test for Each Instrument

Variable	Cronbach Alpha
Competency in Demand	.935
Job in Demand	.987
Emerging Skills	.799
Green Technology	.834
Related Issues	.860

From the table above, the Cronbach Alpha for the questionnaire of Competency in Demand, Job in Demand, Emerging Skills, Green Technology, and Related Issues are .935, .987, .799, .834, and .860, respectively. Therefore, all items in the questionnaire provide good reliability and are suitable to be utilised for research purposes.

3.5 Data Collection Procedure

In order to carry out good research, the researcher must have the overall view of the process for each step of the study that is planned systematically. The research procedure of this study is a combination of qualitative and quantitative approaches, depicted in Figure 3.2. Details elaboration of phases in the data collection procedure is subjected to seven phases:

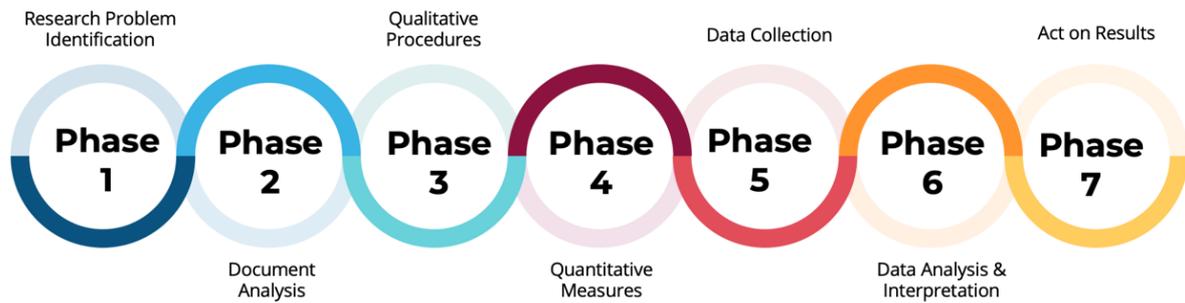


Figure 3.2: Data Collection Procedure in the Study

Phase 1: Research Problem Identification

The initial stage is to identify concerns and/or data gathering possibilities and then decide what to do next. To do this, conducting internal and external assessments to understand what is going on inside and outside the organisation may be effective.

Phase 2: Document Analysis

The second phase is to collect secondary data by reviewing publicly available published information from sources such as websites, archives, and other written reports.

Phase 3: Qualitative Procedures

The qualitative measures acquired from pre-existing or official data that has previously been documented or developed by the organisation throughout its ordinary activities make up the third step. Interviews are documented in a variety of ways during the series of FGDs to gather information offered verbally by industries, including written notes, audio recordings, and video recordings from thirteen participants.

Phase 4: Quantitative Measures

The fourth phase is the cross-sectional survey administered to 377 respondents from Peninsular Malaysia, Sabah, Sarawak, and Labuan. During the pandemic Covid-19 and due to the MCO, the data collection is gathered online.

Phase 5: Data Collection

The fifth phase entails being aware of practical considerations and best practices for dealing with logistical issues that frequently arise throughout this phase. Attention is much given to the process of data collection to ensure its reliability and validity before the next phase is begun. The document analysis and interview are embedded with the questionnaire to be analysed before the triangulation process in the next phase are started.

Phase 6: Data Analysis and Interpretation

The sixth phase is to analyse and interpret the data collected. Depending on the methodologies employed and the amount of quantitative and qualitative data obtained, the analysis can be complex or simple.

Phase 7: Act on Results

The seventh phase is to act on the data, provide a solid basis for creating an effective action plan designed to achieve strategic OF in line with the objective of the study. The mapping of the existing NOSS with the final result of the OF developed is highlighted in this phase.

3.6 Data Analysis Techniques and Procedures

Qualitative data analysis software, NVivo (Release 1.0)/NVivo 1.0 released March 2021, is used to assist in the analysis of the data collected in this research. In qualitative research, the collection and analysis of qualitative data should be a simultaneous process. In this research, the researcher started to analyse the data during the data collection process until the data reached saturation. The interview and FGD are then transformed into the transcript. After that, the researcher started the data analysis process with the thematic coding technique. According

to Merriam and Tisdell (2016), coding is the process of assigning a shorthand identification to distinct components of acquired data so that researchers may quickly retrieve certain bits of information. The information is organised by code, category, and theme. Following that, the researcher used inductive and comparative methodologies to understand the findings.

The information collected from the research process is called data. The data is organised in order to provide meaning to the research. Quantitative analysis provides answer numerically. In contrast, qualitative analysis is more focused on the meaning of the data. Qualitative research uses valid data to answer the research question. According to Fraenkel, Wallen and Hyun (2019), qualitative data analysis is a repeatedly and continuously process that retrieves and reduce large amounts of written information. The data can be collected from interviews, observation or FGD.

Costing is an important consideration that influences the determination of sampling size for a primary survey. The population of the industry is large, and this requires a significant financial budget if a nationally representative survey is the primary target. The consultation with related associations concluded that a nationally representative survey is not feasible. Instead of aiming for a nationally representative sample, the survey aims to increase only participation rates from the industry.

Three strategies to increase the number of responses for the data collection are administered as follows: (1) Targeted of associations' members. The secretariat of each association has agreed to distribute the questionnaire, (2) Industry engagements/interviews are scheduled over a period of two months to seek their assistance to answer the online survey and distribute to the members of the respective associations, and (3) Assistance from related government agencies to provide institutional support when engaging the selected respondents.

The extrapolation method was used to reduce bias in the survey procedure, as suggested by Armstrong and Overton (1977). Non-response bias (error) occurred when respondents varied in significant ways from the non-respondents in the research (Sekaran, 2013), which is common

in self-administrated and via mail survey method (Armstrong & Overton, 1977; Groves, 2002). For this study, online distribution of a survey questionnaire is employed for the data collection. To overcome the non-response from respondents usually occur when respondents decline to answer or have language problems (Groves, 2002).

Quantitative data analysis software, Statistical Package for the Social Sciences (SPSS) Version 20, is used to assist in the analysis of the data collected in this research. The following analyses are obtained from the survey: (1) Analysis of critical occupations identified by the industry, (2) Analysis of the future trend of the occupational demand by various skills category including TVET related occupations, (3) Analysis of talent gaps between supply and demand according to NOSS and MQA standards, and (4) Analysis of training provided by industries to employees.

3.7 Population and Sampling

3.7.1 Sampling Technique and Selection Criteria for Qualitative Approach

The two main criteria of choosing a sample for research are the sample must represent the population and must describe the characteristics of that population (Ary et al., 2002). Sampling techniques in this study is divided into two categories of (1) participants for FGD and (2) respondents for the cross-sectional survey.

Purposive sampling procedures were used to pick participants for the FGD, who were chosen for their availability to help comprehend the research problem and central phenomenon in the study (Glesne, 2011). The selection of sampling techniques is important to obtain research participants who can provide a comprehensive and in-depth source of information on the issues selected by the researcher (Sandelowski, 2000). In the context of this study, there are three conditions for selecting research participants for the FGD, (1) the selected research participants experience the phenomenon or event being studied, (2) can communicate with researchers, and (3) be prepared to provide information on the experiences they have had (Magilvy & Thomas, 2009). Since the selection of the research participants is purposive, the researcher should take into account that the selected participants really volunteer to be involved in this study to reach the saturation point of data gathered.

The criteria established for the study aims to identify sampling that could provide information-rich cases. The first and second criteria are established to address the chosen sampling strategy, which is the criterion-sampling strategy. The third criteria provide the details of the participants to be selected for the study. Participants in the focus groups and interviews for this study should have a minimum of seven years of experience in civil engineering to guarantee they are well-versed in the field. Table 3.3 shows a summary of the study's participants, as well as the data collecting and analytic procedures used.

Table 3.3: Overview of the Study

No.	Research Questions	Participants	Data Collection Techniques	Data Analysis Techniques
1.	How does the OS for MSIC2008, Section F Division 42; Civil Engineering is developed?	Consultant, Industries	Document Analysis	Thematic
2.	What are the critical jobs in the civil engineering industry?	Consultant, Industries	Interview Questionnaire	Thematic Percentage
3.	How does the OD for each JT based on the latest industry OF is developed?	Consultant, Industries	Interview Questionnaire	Thematic Percentage
4.	What are the CiD in the civil engineering industry?	Consultant, Industries	Interview Questionnaire	Thematic Percentage
5.	What are the JT relevant to IR4.0 and green technology in civil engineering study?	Consultant, Industries	Interview Questionnaire	Thematic Percentage

3.7.2 Population and Sample Size for Quantitative Approach

In general, there are seven registered contractor classes for civil engineering categorised according to limitation of finance, paid-up capital, limits of operating area and approval of the company's technical officer. Registered contractors are only allowed to participate in government tenders that are invited for the registration class for which they are registered. Table 3.4 is Statistics on The Number of Contractors (Current) Registered By Civil Engineering Construction Category In 2019. In this study, the stratified random sampling technique is used. A total population of (N) G4-G7 is 21,385 respondents are selected. Thus, the sample number according to the Krejcie and Morgan (1970) sampling table is 377 respondents. Hence, 377 of sample size from the calculation are suitable to be used in this research. According to Krejcie and Morgan (1970), the confidence interval is 95%. Out of 377 samples, 5% may not be appropriate. Mitchell and Jolley (2010) suggested a researcher should add 25% more respondents compared to the needed numbers to avoid data reduction during the data collection procedure. So the questionnaire in this research is distributed to 471 respondents as preparation if the returned questionnaires are not complete or not well answered by respondents. Neuman (2006) suggests 70% return rate is considered representative of the required sample. It is similar to Ary et al. (2006) statement, which stated response rate of more than 70% is normal in any social science research. Respondents in this survey administration are among Managing Director, Project Director, Project Manager, Construction Manager, Site Engineer, and Others.

Table 3.4: Statistics on The Number of Contractors (Current) Registered By Civil Engineering Construction Category in 2019

TAHUN	NEGERI	GRED						
		G1	G2	G3	G4	G5	G6	G7
2019	JOHOR	2858	2806	1962	468	529	142	662
2019	KEDAH	2064	1183	510	172	164	71	239
2019	KELANTAN	1955	1775	327	142	108	62	162
2019	LABUAN	149	105	41	9	12	2	13
2019	MELAKA	1061	776	495	166	155	61	187
2019	NEGERI SEMBILAN	1742	1211	599	184	212	57	150
2019	PAHANG	2159	1409	510	255	177	79	167
2019	PERAK	2566	1424	759	245	264	101	251
2019	PERLIS	801	245	64	24	20	6	30
2019	PULAU PINANG	1419	899	1089	273	347	123	513
2019	PUTRAJAYA	18	17	16	7	2	3	8
2019	SABAH	7890	2739	962	264	276	122	629
2019	SARAWAK	4722	1952	1024	233	308	156	681
2019	SELANGOR	4048	4034	4209	1291	1683	476	2230
2019	TERENGGANU	2198	1257	401	194	202	97	224
2019	WILAYAH PERSEKUTUAN	1450	1094	2775	889	1612	512	2282

For the sample size of this research, the calculation technique from Krejcie and Morgan (1970) is used to get an accurate sample size. Based on calculation from 21,385 of population, the sample size is 377 respondents. Table 3.5 shows the number of targeted respondents in the study.

Table 3.5: Number of Targeted Respondents According to MSIC Group

MISC Section	F	Construction	Number of Establishment	Number of Sample Establishment	Number of Targeted Respondents	Number of Actual Respondents
MSIC Division	42	Civil Engineering				
MSIC Group	421	Construction Of Roads and Railways	21,385	377	377	377
	422	Construction Of Utility Projects				
	429	Construction Of Other Civil Engineering Projects				

Details elaboration of research methodology in the study is shown in Figure 3.3.

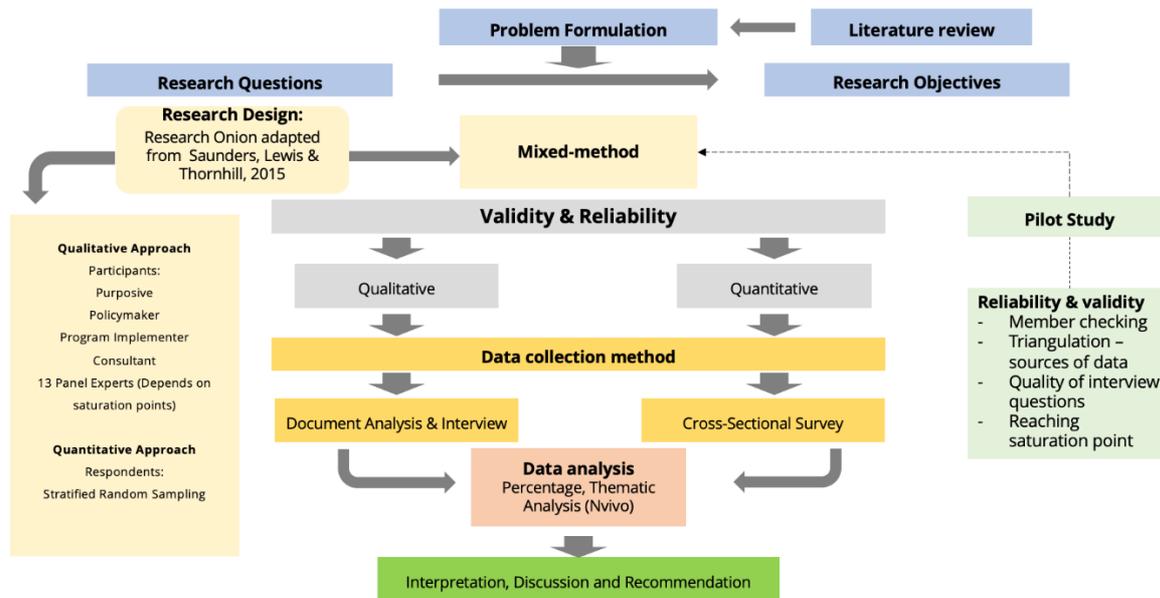


Figure 3.3: Research Methodology of the Study

3.8 Ethical Considerations

Informed permission, safeguarding participants from harm, and maintaining confidentiality are among the measures used in this study to secure their safety and rights. Throughout the study, informed consent is a top priority. The study is explained to all participants verbally and in writing, and participation is entirely voluntary. All participants give their written agreement to participate in the study willingly. The written consent outlines the study's guidelines and parameters, and participants have the option to withdraw at any moment. Records and data, nobody other than the researcher will have access to these materials. Second, while making decisions on data reporting and dissemination, the participants' rights and interests are given top priority. The researcher assures that the names of the sample schools, as well as any other personally identifiable information or features, are kept private. The storage of research-related records and data will be secured using precautionary methods, and only the researcher will have access to these materials.

3.9 Issues of Trustworthiness

The reliability of qualitative research should be judged differently from that of quantitative research. Lincoln and Guba (1985) utilised the terms credibility, dependability, confirmability, and transferability to replace the traditional criteria – validity, reliability, objectivity, and generalizability – that are usually employed in quantitative studies to prove the qualitative

study's trustworthiness. The following are some of the ways in which this study addresses the question of trustworthiness.

3.9.1 Credibility

The credibility (or validity) criterion indicates if the findings are true and credible from the researcher's, participants', and reader's perspectives. Triangulation and member checks are two strategies used to increase the study's trustworthiness.

3.9.2 Triangulation in this Study

According to Denzin (1994), there are four types of triangulation used in qualitative research, namely the methodological triangulation, theoretical triangulation, data or source triangulation and researcher triangulation. This study employs methodological and data or source triangulation to confirm emerging findings. The data gained from different sources, namely the administrators, teachers and students during the interview, as well as the data generated from other methods such as documents analysis and observation, will be triangulated on the same set of research questions. Using numerous ways and sources to collect data offers a more complete and richer picture of the topic under consideration. Through triangulation, the case study's findings will have been supported by several sources of evidence and the credibility of the findings is argued to be more robust (Yin, 2018; Marshall & Rossman, 2016).

3.9.3 Member Checks

Member checks are also used, which involve sharing the data and interpretation with the participants. To ensure that the researcher's own biases do not impact how participants' opinions are portrayed, member checks are undertaken by providing the transcribed interviews to participants for review. This is also to invite participants to confirm one's findings and to ensure the accuracy of the findings (Marshall & Rossman, 2016).

3.9.4 Dependability

The degree to which research findings may be duplicated by other similar investigations is referred to as reliability. It can be compared to dependability which is concerned with maintaining the chain of evidence by tracing and documenting the research processes to establish coherent linkages between the data and reported findings (Liamputtong, 2009). In this study, dependability is gained through an auditing process known as audit trail by documenting in detail the research processes such as the choices of methodology, the methods of data collection and how the data will be analysed and interpreted. Merriam (1998) describes audit trail as offering "transparency of method" in which researchers keep a journal and a record of memos that include detailed accounts of how the data will be collected, analysed and interpreted.

3.9.5 Transferability

The topic of transferability, which refers to the extent to which this particular phenomenon in this particular situation can be transferred to other contexts, is addressed in this study. The issue of transferability is addressed in this study by providing detailed information as well as a thick and rich description of the participants and their surroundings. A qualitative account's claim to relevance in a broader context is based on its depth, richness, and precise description (Schram, 2003).

3.10 Researcher Bias and Assumption

The researcher is the most important tool in qualitative research (Creswell & Poth, 2018; Merriam & Tisdell, 2016; Patton, 2015). The expertise, competency, and rigour of the fieldworker have a significant impact on the quality of the qualitative investigation. The researcher must carefully consider, deal with, and report potential sources of bias and mistake in order to provide high-quality qualitative data. Several strategies, such as systematic data gathering procedures employing different data sources, triangulating the data, and recording an audit trail, will be used to avoid potential biases, as stated above. In addition, it is important that the researcher is aware of the skills, experiences, perspective and background that she brings into the inquiry as it will affect what is studied and help shape what is discovered. Thus, the researcher has to engage in reflexivity, which requires a keen and astute self-awareness to

ensure that she understands her own perspectives and owning to that perspectives as a way of 'sharpening the instrument' (Brown, 1996, p. 42 as cited in Patton, 2015).

3.11 Conclusion

Document analysis, focus groups, and surveys were chosen as the research methods. Document analyses are preferred since they are a quick and easy approach to acquiring information. This is due to the fact that the documents are manageable and useful. Documents can be gotten from a commonplace, but they can be derived in a variety of ways and are a valid source of data. Furthermore, getting and evaluating records is frequently significantly less expensive and time-consuming than conducting the research. Consequently, document analysis is a suitable method in this research because of its requirement for current statistics in related industries as well as to study the industry's growth. Another research approach is FGD that allows free and open discussion among the respondents that generates useful and new ideas and decision making. It is also a fast way to gain the needed information pertaining to JT in the related industries. This approach was the advantage of time-saving and an effective way to gather information from many sources. A survey questionnaire is employed and administered via a random sampling method to all respondents. A survey is an effective way for gathering some sensitive information when it is required. This is due to the shorter and more concise the questionnaire is; the more specific is the group of respondents, the more effective the result will be. In a nutshell, the utilisation of multiple methods or data sources in the study develops a comprehensive finding of the phenomena triangulated from the research approach employed in the study.

CHAPTER 4

FINDINGS

4.1 Introduction

The findings of this study are based on the objective of the research, which includes developing an OF for the civil engineering industry based on MSIC 2008. This includes determining an OD for each JT identified in the most recent industry of OS, highlighting CiD, Job in Demand, Emerging Skills, Green Technology, and Related Issues in the civil engineering field, as well as identifying JT related to Industry Revolution 4.0 (IR4.0) and determining critical JT.

The key findings of the study initially describe the demographic profiles of the participants and respondents. Next, this chapter summarises the research findings of document analysis, FGD from the perspectives of the panel experts, and the online cross-sectional survey. Finally, this chapter ends with a summary.

4.2 Demographic Profile of the Participants

In conducting the FGD, the study involves thirteen participants among the panel experts from industries. Four series of FGD occurred alternately in order to reach the saturation point of qualitative data collection. Only one female participate in the FGD, while the other twelve participants are males. All participants selected possess more than 7 years of experience in industries. The demographic profile is taken into consideration due to the fact that the findings of the study could be influenced by their gender and working experience. An Informed Consent Form gathered from 13 participants is listed in Annex 5.

13 participants are coded using inductive coding that tends to be more efficient in the long run. The inductive coding method is used when the researcher knows little about the research subject and conducting heuristic or exploratory research. In qualitative research, coding is how you define the data you are analysing (Gibbs, 2007). It is a process of identifying a passage in the text or other data items (photograph, image), searching and identifying concepts and finding relations between them. In these findings, the initial coding, also known as open coding, is utilised in determining each participants' information during the data collection process. The

initial coding of (1) Ind means Industry, (2) OF means Occupational Framework, and (3) the number of panellist coding determine the number of participants in the FGD.

Participant **Ind/OF/01** has more than 20 years of experience in the field of civil engineering related to project planning, project engineer, quality assurance, and quality control. This participant is currently involved in the management division. Among his work experience are in high-rise building construction, new hospital construction, PLUS highway widening, luxury housing construction and station and tunnel construction for MRT projects. Participant **Ind/OF/02** is a Senior Manager at a Senai-Desaru highway construction company. Prior to that, he was heavily involved in civil engineering work at various companies. He has also served as a project manager, consulting engineer, structural engineer and also senior engineer. Armed with experience since 1986, he is certainly very helpful as a panel of developers. He is responsible for the conceptual and final design of structures (concrete, steel, timber and composite), emphasising the soundness of the design technically and financially, the leading project team in the execution of jobs, site supervision, administration of contracts and project cost control. Maintain liaison and coordination with authorities, clients, architects, contractors and other disciplines (M&E). This includes supervising and checking design team members.

Participant **Ind/OF/03** is a Civil Engineer working in the private sector who graduated from Universiti Teknologi MARA (UiTM). She has 13 years of experience in civil engineering and project management, involved with work for water supply projects such as the construction of water treatment plants, pump houses, and pipelines. She holds a master's degree in Occupational Safety and Health (OSH) from Universiti Teknologi Malaysia (UTM) and is directly involved in safety and health and has been a CIDB certified trainer for Green Card for 9 years in the construction industry. Participant **Ind/OF/04** holds the position of Managing Director at a construction company. He began his career as an Assistant Director of Building at JKR Selangor, then as a Civil Engineer in the Civil Structure design branch at JKR headquarters. He was formerly a District Engineer in Kuala Langat, Selangor, and has more than 22 years of experience in this industry.

Participant **Ind/OF/05** has forty years of professional work experience in the Water and Wastewater sectors. His working experience covers Design, Resident Engineer at Site, Site management for Main Contractor, Project Management, Project Administration,

Subcontracting, Marketing & Business Development, Operation and Maintenance of WTPs & STPs and Pipelines and networks. Participant **Ind/OF/06** is a professional engineer in the field of civil engineering, currently holds the position of General Manager of Construction at a relatively large construction company in the country. He has more than 13 years of experience in this industry and has also been the manager of beautification projects and interceptor works, technical executive officer for the handling of excavation work and utility management throughout Johor. Apart from that, he has also been involved in the management of coastal highway projects and sea reclamation.

Participant **Ind/OF/07**, a civil engineer by training, graduated from Memphis State University, Memphis, Tennessee, the USA in 1984. He has been involved extensively in the manufacturing of precast concrete products and construction industries since more than 35 years ago. He has vast experience in construction activities, supplying ready mixed concrete and manufacturing & supplying prefab/precast concrete products, including IBS components. Participant **Ind/OF/08** has sixteen years of experience in construction and civil engineering. He is currently a project engineer at the company where he currently works. He was previously had experience as a resident assistant engineer, C & S engineer, and civil engineer. Some of the projects he has been involved in are the Klang Valley MRT project, a water plant construction project and an integrated water supply scheme.

Participant **Ind/OF/09** is a Special Officer & Strategy Management at CIDB Malaysia. He has more than eight years of working experience in strategising and managing an organisation's performance management framework, transformation program, corporate governance, corporate strategy, Human Resources (HR) strategy and Operational strategy. Apart from that, the tasks he performed are spearhead in establishing, managing and connecting CIDB's corporate strategy, HR strategy and operation strategy, implement and managing performance management framework using Balanced Scorecard (BSC) framework to all divisions, subsidiaries and state offices, provide consultation and advisory services on a project implementation strategy to CIDB Board of Directors and CIDB top management, as well as producing the quarterly report for CIDB's BSC, ministry-level KPIs and minister KPIs.

Participant **Ind/OF/10** began his career as a civil engineer in 1998. He is later transferred to public sector positions in the JKR at various levels, namely in the state and also the ministry level that manages construction, JKR special projects, civil engineering, structures and bridges. He is currently a Kinta District Engineer, JKR Perak. Participant **Ind/OF/11** has more than 22

years of experience in construction and civil engineering. He started working with various construction companies, began with a structural engineer, resident engineer, design engineer, site engineer, project manager and now as a project consultant. He has wide experience with various scopes of work performed, and he is very helpful in developing employment frameworks in the field of civil engineering.

Participant **Ind/OF/12** currently holding a position as an engineer in the district of Sepang, Selangor. He began his career as a civil engineer, assistant director, general manager of construction and superintendent civil engineer. He has served in the health work branch, JKR headquarters, civil engineering branch, structures and bridges of JKR headquarters, and the general building works branch of JKR headquarters, Ministry of Works. Participant **Ind/OF/13** is a Senior Manager of the IBS & BIM Department, a new department under the Construction Technology Division in CIDB. Before that, he was the Head of Sustainable Construction Unit, CIDB (MAMPAN). He manages the execution of CITP Thrust on Sustainable Construction through the implementation of policies, marketing effort, collaboration with other agencies and industry, sustainable products labelling and categorisation, construction waste management in collaboration with SWCorp, international cooperation and thorough assessment of sustainable construction practices (using myCREST & Sustainable INFRASTAR rating tools, CO2 and zero energy targets).

Participants' coding, gender, and working experience among panel experts in the FGD are shown in Table 4.1.

Table 4.1: Demographic Profile of Participants

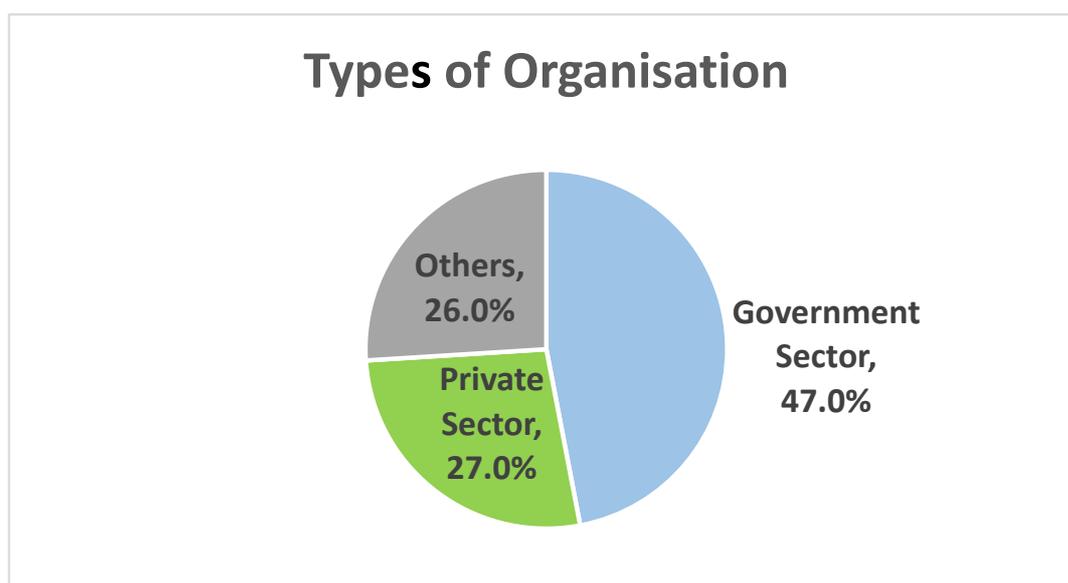
NO.	PARTICIPANT'S CODING	GENDER	WORKING EXPERIENCE
1.	Code: Ind/OF/01	Male	>20 years
2.	Code: Ind/OF/02	Male	>35 years
3.	Code: Ind/OF/03	Female	>13 years
4.	Code: Ind/OF/04	Male	>22 years

5.	Code: Ind/OF/05	Male	>40 years
6.	Code: Ind/OF/06	Male	>13 years
7.	Code: Ind/OF/07	Male	>35 years
8.	Code: Ind/OF/08	Male	>16 years
9.	Code: Ind/OF/09	Male	>5 years
10.	Code: Ind/OF/010	Male	>23 years
11.	Code: Ind/OF/11	Male	>22 years
12.	Code: Ind/OF/12	Male	>22 years
13.	Code: Ind/OF/13	Male	>18 years

The survey questionnaire was administered to 270 respondents from various businesses, with a 70 per cent return rate predicted by Newman (2006). 54 per cent of the respondents are over the age of 41, while the remaining 46 per cent are between the ages of 20 and 30. With 79 per cent of respondents being male, Project Managers are the most common respondent in the data acquired from the majority of government sectors, with 47 per cent responses. Table 4.2 shows the survey's respondents in detail. As indicated in Figure 4.1, the government sector has the biggest number of organisations active in data gathering, with 47 per cent of respondents.

Table 4.2: Demographic Profile of Respondents

PROFILE	DETAILS	RESPONDENTS
Age	20 - 30	124
	31 - 40	0
	41 above	146
Gender	Male	213
	Female	57
Position in Organisation	Managing Director	16
	Project Director	27
	Project Manager	73
	Construction Manager	38
	Site Engineer	51
	Others	
	Site Supervisor	26
	Consultant	18
	Scholars	21
	Types of Organization	Government Sector
Private Sector		73
Others		70

**Figure 4.1: Types of Organisation among Respondents**

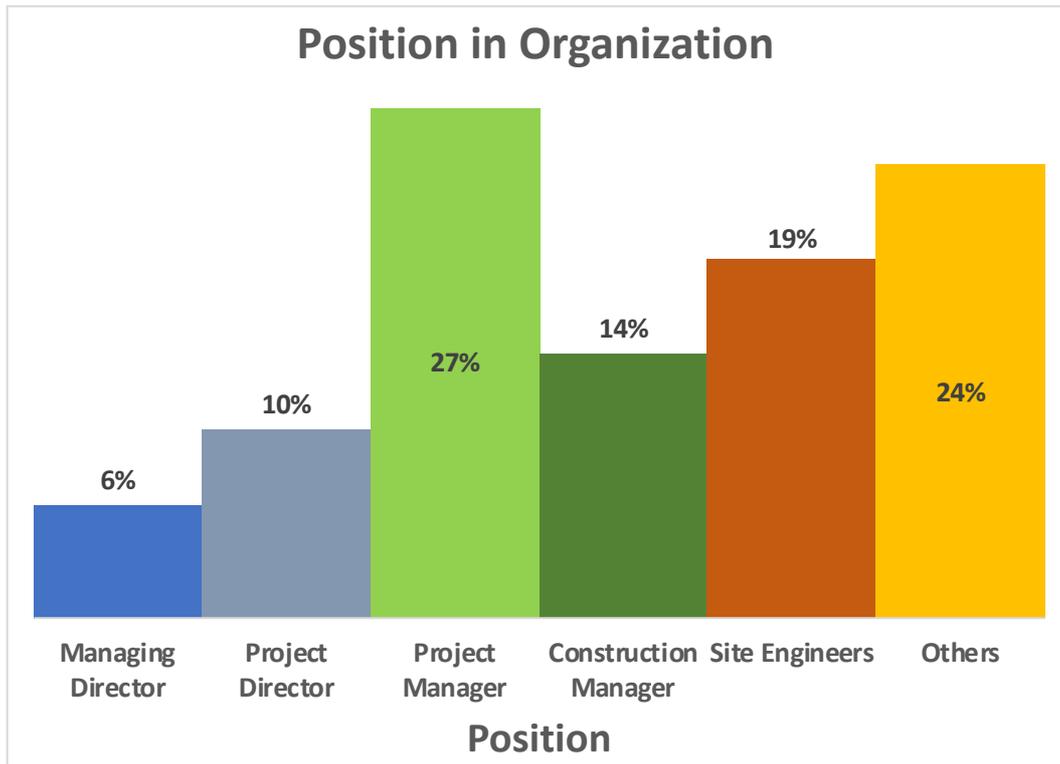


Figure 4.2: Position in Organization among Respondents

4.3 Findings of the Study

Results are presented according to the research questions of the study. Document analysis, interviews, and surveys are regarded as the main source of data focusing on the development of civil engineering frameworks.

4.3.1 Analysis of the OS for MSIC2008, Section F Division 42; Civil Engineering Development

This section explains the analysis of MSIC2008 in the field of civil engineering. The excerpt in Figures 4.1, 4.2, and 4.3 shows the analysis of the MSIC2008, Section F Division 42; Civil Engineering Development coded and categorised using NVivo 1.0.

- a. Findings indicated that the OS for Road & Railway Field is developed based on the Job Area of the survey, earthwork, road work (road base), premix, road furniture, streetlight, wiring, road line marking, traffic management, installation (steelwork), cutting/welding (steelwork), grouting, tunnelling, bridge structure, drainage system, launching, retaining wall, slope protection, ground treatment, and scaffolding are the most critical job areas

Shadow Vehicle Driver, Installer, Chainman, Mechanic, Welder, Bar Benders, Concreters, Scaffolders/Installer and General Workers. These Job Areas are presented distinctively from Level 8 to Level 1 competencies.

b. Findings indicated that the OS for Utility Field is developed based on the Job Area of trenching, pipework, concrete precast panel, brick manhole, direct horizontal drilling, traffic management, power supply, telecommunication, water supply, sewerage, and drainage. These findings are coded and categorised using NVivo1.0 in Figure 4.4.

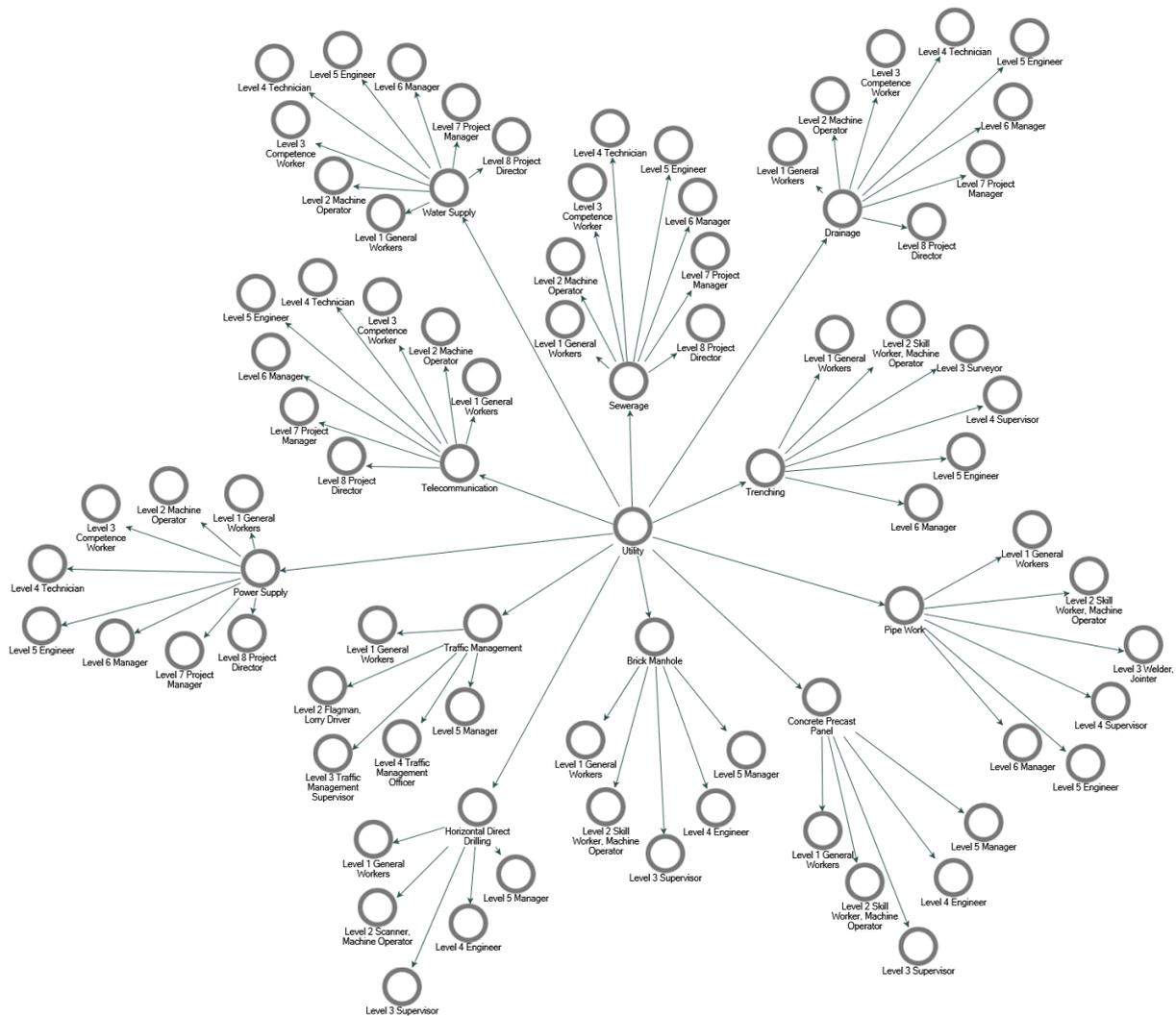


Figure 4.4: Analysis of Occupational Structure Development for Utility Field coded and categorised in NVivo 1.0

Variation of Job Area designated from Project Director, Project Manager, Manager, Engineer, Supervisor, Traffic Management, Technician, Surveyor, Welder/Joiner, Competence

Workers, Skill Worker, Machine Operator, Scanner, Flagman, Lorry Driver, and General Workers. These Job Areas are presented distinctively from Level 8 to Level 1 competencies.

c. Findings indicated that the OS for Other Fields is developed based on the Job Area of port/harbour/marinas, airport/runway, flood mitigation system, dams/dykes, river works, and sport are the most critical job areas in the Other Field. These findings are coded and categorised using NVivo 1.0 in Figure 4.5.

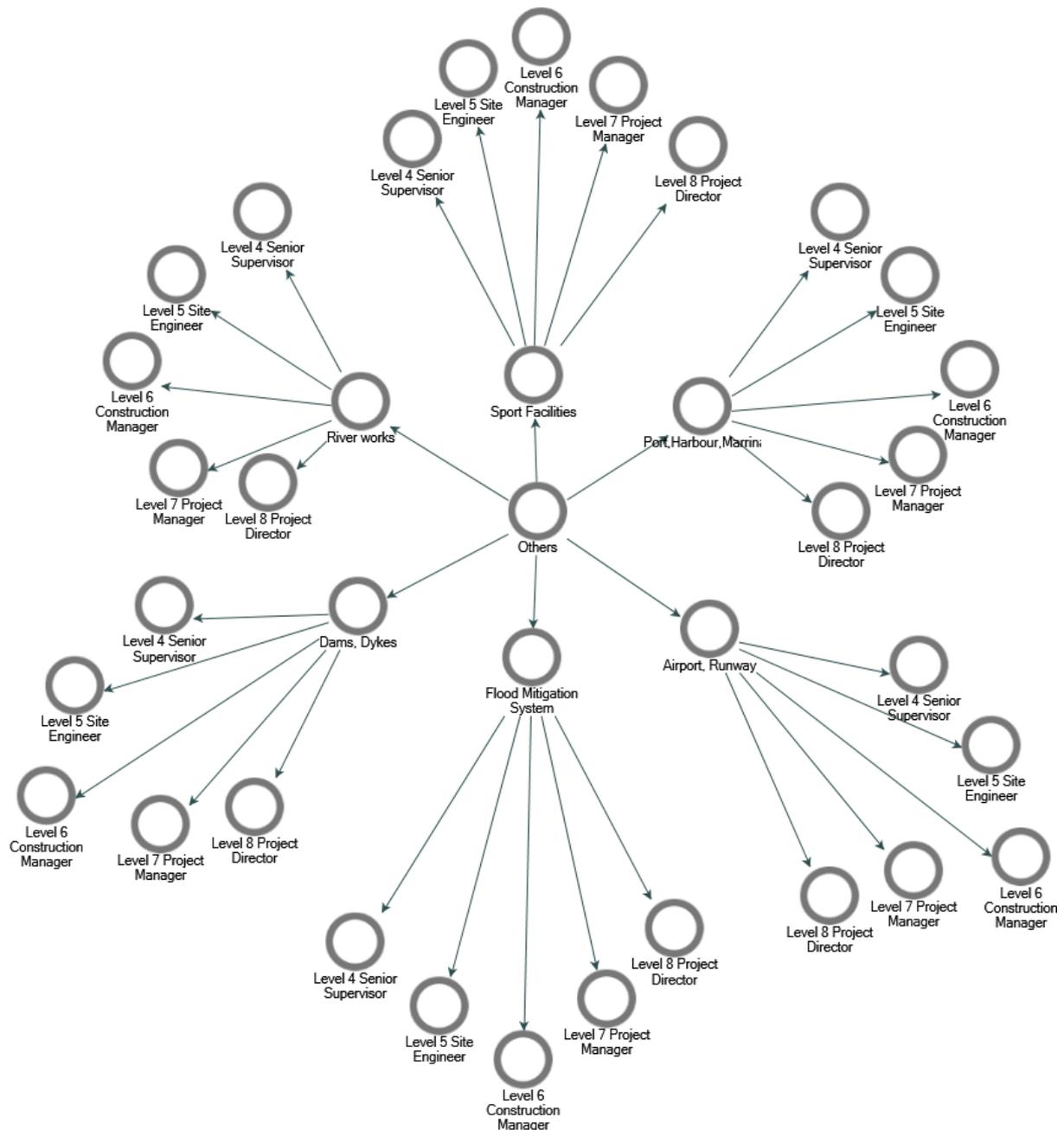


Figure 4.5: Analysis Occupational Structure Development for Other Field coded and categorised in NVivo 1.0

Variation of Job Area is designated from Project Director, Project Manager, Construction Manager, Site Engineer, and Senior Supervisor. These Job Areas are presented distinctively from Level 8 to Level 4 competencies.

Further description pertaining to OS development for each Group of (1) Road & Railways Field, (2) Utility Field, and (3) Other Field is shown in Table 4.3 until 4.16.

Table 4.3: Group 421 Occupational Structure (1of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	<i>Road Work</i>	<i>Road Line Marking</i>	<i>Road Furniture</i>
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	Construction Manager	No Job Title	No Job Title
LEVEL 5	Site Engineer	No Job Title	No Job Title
LEVEL 4	Road Construction Senior Supervisor	No Job Title	Road Furniture Senior Supervisor
LEVEL 3	Road Construction & Maintenance Supervision	Road Painter Supervisor*	Road Furniture Supervisor
LEVEL 2	Road Construction Operation	Machine Operator Road Painter*	Road Furniture Installer
LEVEL 1	General Workers	General Workers	General Workers

Note: *Critical Job Titles

Table 4.4: Group 421 Occupational Structure (2 of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	<i>Noise Barrier</i>	<i>Traffic Management (Shadow Traffic)</i>	<i>Traffic Management (Signalling)</i>
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	No Job Title	Traffic Manager	Traffic Manager
LEVEL 5	No Job Title	Construction Traffic Management Officer (CTMO)***	Construction Traffic Management Officer (CTMO)***
LEVEL 4	Noise Barrier Senior Supervisor	Traffic Supervisor	Traffic Supervisor
LEVEL 3	Noise Barrier Supervisor*	Traffic Controller	Traffic Controller
LEVEL 2	Noise Barrier Installer*	Shadow Vehicle Driver	Flagman*
LEVEL 1	General Workers	General Workers	General Workers

Note: *Critical Job Titles *** Critical Job Titles and Jobs relevant to IR4.0

Table 4.5: Group 421 Occupational Structure (3 of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	<i>Road Drainage System (Reinforcement Work)</i>	<i>Road Drainage System (Concrete Works)</i>	<i>Road Drainage System (Timber Work)</i>
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	No Job Title	No Job Title	No Job Title
LEVEL 5	Site Engineer	Site Engineer	Site Engineer
LEVEL 4	Road Drainage Senior Supervisor	Road Drainage Senior Supervisor	Road Drainage Senior Supervisor
LEVEL 3	Road Drainage Supervisor	Road Drainage Supervisor	Road Drainage Supervisor
LEVEL 2	Road Drainage Bar Bender*	Road Drainage Concreter*	Road Drainage Carpenter*
LEVEL 1	General workers	General workers	General workers

Note: *Critical Job Titles

Table 4.6: Group 421 Occupational Structure (4 of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	<i>Road Drainage System (Brick Work)</i>	<i>Installation (Steelwork)</i>	<i>Cutting / Welding (Steelwork)</i>
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	No Job Title	Construction Manager	No Job Title
LEVEL 5	Site Engineer	Site Engineer	No Job Title
LEVEL 4	Road Drainage Senior Supervisor	Steelwork Senior Supervisor	Steelwork Senior Supervisor
LEVEL 3	Road Drainage Supervisor	Steelwork Supervisor	Steelwork Supervisor
LEVEL 2	Road Drainage Bricklayer*	Steelwork Installer	Steelwork Welder*
LEVEL 1	General workers	General Workers	General Workers

Note: *Critical Job Titles

Table 4.7: Group 421 Occupational Structure (5 of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	<i>Retaining Wall</i>	<i>Slope Protection</i>	<i>Grouting</i>
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	No Job Title	No Job Title	No Job Title
LEVEL 5	Site Engineer	Site Engineer	No Job Title
LEVEL 4	Retaining Wall Senior Supervisor	Slope Protection Senior Supervisor	No Job Title
LEVEL 3	Retaining Wall Supervisor*	Slope Protection Supervisor	Grouting Supervisor
LEVEL 2	Retaining Wall Machine Operator**	Slope Protection Machine Operator**	Grouting Foreman
LEVEL 1	General Worker	General Worker	Grouter

Note: *Critical Job Titles **Jobs relevant to IR4.0

Table 4.8: Group 421 Occupational Structure (6 of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	<i>Tunnel Lining (Segment)</i>	<i>Tunnel Lining (Crane)</i>	<i>Tunnel Boring</i>
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	Construction Manager**	Construction Manager**	Tunnel Manager**
LEVEL 5	Segment Engineer**	Segment Engineer**	Shift Boss **
LEVEL 4	Senior Material Coordinator**	Senior Plant Coordinator**	Tunnel shift engineer**
LEVEL 3	Supervisor***	Plant Coordinator***	TBM Operator*
LEVEL 2	Tunnel Technician***	Hoisting Supervisor***	TBM Mechanic**
LEVEL 1	Assistant Tunnel Technician*	Tunnel Crew*	Tunnel Crew*

Note: *Critical Job Titles **Jobs relevant to IR4.0

*** Critical Job Titles and Jobs relevant to IR4.0

Table 4.9: Group 421 Occupational Structure (7 of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	<i>Tunnel Plant & Workshop</i>	<i>Tunnel Safety</i>	<i>Beam Launching</i>
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	Plant Manager**	Construction Manager**	No Job Title
LEVEL 5	Plant Engineer**	Tunnel Engineer**	Site Engineer*
LEVEL 4	Senior Mechanic Foreman**	Shift Boss**	Beam Launcher Senior Supervisor*
LEVEL 3	Mechanic Foreman**	ERT Foreman*	Beam Launcher Supervisor*
LEVEL 2	Surface & Workshop Mechanic**	ERT Crew*	Beam Launcher Operator*
LEVEL 1	Tunnel Crew*	Tunnel Crew*	General workers

Note: *Critical Job Titles **Jobs relevant to IR4.0

Table 4.10: Group 421 Occupational Structure (8 of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	<i>Bridge Structure (Prestressed)</i>	<i>Bridge Structure (Concrete Work)</i>	<i>Bridge Structure (Reinforcement Work)</i>
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	Construction Manager**	Construction Manager**	Construction Manager**
LEVEL 5	Site Engineer**	Site Engineer**	Site Engineer**
LEVEL 4	Pre & Post Tensioned Senior Supervisor*	Bridge Structure Senior Supervisor*	Bridge Structure Senior Supervisor
LEVEL 3	Pre & Post Tensioned Supervisor*	Bridge Structure Supervisor*	Bridge Structure Supervisor
LEVEL 2	Pre & Post Tensioned Crew*	Bridge Structure Concreter*	Bridge Structure Bar Benders*
LEVEL 1	General Workers	General Workers	General Workers

Note: *Critical Job Titles **Jobs relevant to IR4.0

Table 4.11: Group 421 Occupational Structure (9 of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	<i>Bridge Structure (Rigging)</i>	<i>Bridge Bearing</i>	<i>Bridge Expansion Joint</i>
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	Construction Manager**	No Job Title	No Job Title
LEVEL 5	Site Engineer**	No Job Title	No Job Title
LEVEL 4	Bridge Structure Senior Supervisor*	Bridge Bearing Senior Supervisor	Expansion Joint Senior Supervisor
LEVEL 3	Bridge Structure Supervisor*	Bridge Bearing Supervisor	Expansion Joint Supervisor
LEVEL 2	Bridge Structure Rigger*	Bridge Bearing Installer*	Expansion Joint Installer*
LEVEL 1	General Workers	No Job Title	No Job Title

Note: *Critical Job Titles **Jobs relevant to IR4.0

Table 4.12: Group 422 Occupational Structure (1 of 3)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(422) CONSTRUCTION OF UTILITY PROJECTS		
AREA	Pipeline (Cutting / Joining)	Pipeline(Jacking)	Concrete Precast Panel
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	Construction Manager**	Construction Manager**	Construction Manager**
LEVEL 5	Site Engineer**	Site Engineer**	Site Engineer**
LEVEL 4	Pipeline Coordinator**	Pipeline Coordinator**	Precast Panel Coordinator**
LEVEL 3	Pipeline Supervisor**	Pipe Jacking Operator **	Precast Panel Supervisor**
LEVEL 2	Pipeline Fitter II*	Assistant Pipe Jacking Operator*	No Job Title
LEVEL 1	Pipeline Fitter I*	No Job Title	No Job Title

Note: **Jobs relevant to IR4.0

Table 4.13: Group 422 Occupational Structure (2 of 3)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(422) CONSTRUCTION OF UTILITY PROJECTS		
AREA	Drainage	Manholes (Brick Work)	Telecommunication Tower
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	Construction Manager	No Job Title	Construction Manager**
LEVEL 5	Site Engineer	Site Engineer	Site Engineer**
LEVEL 4	Drainage Coordinator**	Drainage Coordinator**	Telecommunication Tower Coordinator**
LEVEL 3	Drainage Supervisor **	Drainage Supervisor**	Telecommunication Tower Supervisor **
LEVEL 2	Senior Drain Layer**	Manholes Bricklayer*	Telecommunication Tower Machine Operator**
LEVEL 1	Drain Layer	General Workers	General Workers

Note: *Critical Job Titles **Jobs relevant to IR4.0

Table 4.14: Group 422 Occupational Structure (3 of 3)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(422) CONSTRUCTION OF UTILITY PROJECTS		
AREA	Power Supply	Water Supply	Domestic Sewerage System
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	Construction Manager**	Construction Manager**	Construction Manager**
LEVEL 5	Site Engineer**	Site Engineer**	Site Engineer**
LEVEL 4	Power Supply Coordinator**	Water Supply Coordinator**	Coordinator**
LEVEL 3	Power Supply Supervisor**	Water Supply Supervisor **	Sewerage Civil and Structure Supervisor **
LEVEL 2	Power Supply Machine Operator**	Water Supply Machine Operator**	Sewerage C & S Fitter**
LEVEL 1	General Workers	General Workers	Sewerage C & S Installer

Note: **Jobs relevant to IR4.0

Table 4.15: Group 429 Occupational Structure (1 of 2)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(429) CONSTRUCTION OF OTHER CIVIL ENGINEERING PROJECTS		
AREA	Port/Harbour /Marinas	Airport Runway	Flood Mitigation System
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	Construction Manager**	Construction Manager***	Construction Manager**
LEVEL 5	Site Engineer**	Site Engineer***	Site Engineer**
LEVEL 4	Port/Harbour /Marinas Coordinator**	Airport Runway Coordinator***	Flood Mitigation Coordinator**
LEVEL 3	Port/Harbour /Marinas Supervisor **	Airport Runway Supervisor ***	Flood Mitigation Supervisor **
LEVEL 2	Port/Harbour /Marinas Machine Operator**	Machine Operator**	Flood Mitigation Machine Operator**
LEVEL 1	General Workers	General Workers	General Workers

Note: **Jobs relevant to IR4.0

*** Critical Job Titles and Jobs relevant to IR4.0

Table 4.16: Group 429 Occupational Structure (2 of 2)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(429) CONSTRUCTION OF OTHER CIVIL ENGINEERING PROJECTS		
AREA	Dams / Dykes	River works	Sport Facilities
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	Construction Manager**	Construction Manager**	Construction Manager**
LEVEL 5	Site Engineer**	Site Engineer**	Site Engineer**
LEVEL 4	Dams Coordinator**	River works Coordinator**	Sports Facilities Coordinator**
LEVEL 3	Dams Supervisor **	River works Supervisor **	Sports Facilities Supervisor **
LEVEL 2	Dams Machine Operator**	River works Machine Operator**	Machine Operator**
LEVEL 1	General Workers	General Workers	General Workers

Note: **Jobs relevant to IR4.0

Job Title (JT) Summary by Area

The JT is defined by panel experts involved in the FGD, starting with MSIC2008's document analysis during the FGD. Duplication areas were discovered in numerous sections and divisions, which were listed in MSIC2008.

The JT identified which require a holistic approach in the development of a standard, skills training and also certification for recognition. If the competency requirements are documented in the NOSS format, the personnel in these areas will obtain more structured skills training. This will also enable personnel who are experienced and skilled to be certified through the Recognition of Prior Achievement.

Forty-five job areas are recognised as the main JT in the civil engineering industry, listed from Level 1 to Level 8. JT that fulfil the category of Level 1 – 8 are listed among job areas of Premix, Tunnel Lining (Segment), Tunnel Lining (Tunnel Hoisting), Tunnel Lining (Crane), Tunnel Boring, Tunneling Safety, Tunneling Plant & Workshop, Bridge Structure (Reinforcement Work), Bridge Structure (Prestressed), Bridge Structure (Concrete Work), Bridge Structure (Rigging), Telecommunication Tower, Power Supply, Water Supply, Domestic Sewerage System, Port/Harbor/Marinas, Airport runway, Flood Mitigation System, Dams/Dykes/ River Works, and Sports Facilities. Further JT Summary by Area is presented in Table 4.17.

Based on the Job Title Area, it is summarised that a total number of 223 Identified Job Title is encountered, 49 Critical Job Title is met, and 101 Job Title Relevant to IR4.0 and Green Technology is listed. Details of the Job Title Summary is also presented in Table 4.17.

Table 4.17: Job Title Summary by Area

No	Job Area	1	2	3	4	5	6	7	8
1	Road Work	1	1	1	1	1	1	NJT	NJT
2	Road Line Marking	1	1	1	NJT	NJT	NJT	NJT	NJT
3	Road Furniture	1	1	1	1	NJT	NJT	NJT	NJT
4	Noise Barrier	1	1	1	1	NJT	NJT	NJT	NJT
5	Traffic Management (Shadow Traffic)	1	1	1	1	1	1	NJT	NJT
6	Traffic Management (Signalling)	1	1	1	1	1	1	NJT	NJT

7	Road Drainage System (Reinforcement Work)	1	1	1	1	1	NJT	NJT	NJT
8	Road Drainage System (Concrete Works)	1	1	1	1	1	NJT	NJT	NJT
9	Road Drainage System (Timber Work)	1	1	1	1	1	NJT	NJT	NJT
10	Road Drainage System (Brick Work)	1	1	1	1	1	NJT	NJT	NJT
11	Installation (Steelwork)	1	1	1	1	1	1	NJT	NJT
12	Cutting / Welding (Steelwork)	1	1	1	1	NJT	NJT	NJT	NJT
13	Retaining Wall	1	1	1	1	1	NJT	NJT	NJT
14	Slope Protection	1	1	1	1	1	NJT	NJT	NJT
15	Grouting	1	1	1	NJT	NJT	NJT	NJT	NJT
16	Tunnel Lining (Segment)	1	1	1	1	1	1	NJT	NJT
17	Tunnel Lining (Crane)	1	1	1	1	1	1	NJT	NJT
18	Tunnel Boring	1	1	1	1	1	1	NJT	NJT
19	Tunnelling Plant & Workshop	1	1	1	1	1	1	NJT	NJT
20	Tunnelling Safety	1	1	1	1	1	1	NJT	NJT
21	Beam Launching	1	1	1	1	1	NJT	NJT	NJT
22	Bridge Structure (Prestressed)	1	1	1	1	1	1	NJT	NJT
23	Bridge Structure (Concrete Work)	1	1	1	1	1	1	NJT	NJT
24	Bridge Structure (Reinforcement Work)	1	1	1	1	1	1	NJT	NJT
25	Bridge Structure (Rigging)	1	1	1	1	1	1	NJT	NJT
26	Bridge Bearing	NJT	1	1	1	NJT	NJT	NJT	NJT
27	Bridge Expansion Joint	NJT	1	1	1	NJT	NJT	NJT	NJT
28	Pipeline (Cutting / Joining)	1	1	1	1	1	1	NJT	NJT
29	Pipeline (Jacking)	NJT	1	1	1	1	1	NJT	NJT
30	Concrete Precast Panel	NJT	NJT	1	1	1	1	NJT	NJT
31	Drainage	1	1	1	1	1	1	NJT	NJT
32	Manholes (Brick Work)	1	1	1	1	1	NJT	NJT	NJT
33	Telecommunication Tower	1	1	1	1	1	1	NJT	NJT
34	Power Supply	1	1	1	1	1	1	NJT	NJT
35	Water Supply	1	1	1	1	1	1	NJT	NJT
36	Domestic Sewerage System	1	1	1	1	1	1	NJT	NJT
37	Port/Harbour /Marinas	1	1	1	1	1	1	NJT	NJT
38	Airport Runway	1	1	1	1	1	1	NJT	NJT
39	Flood Mitigation System	1	1	1	1	1	1	NJT	NJT
40	Dams / Dykes	1	1	1	1	1	1	NJT	NJT
41	River works	1	1	1	1	1	1	NJT	NJT
42	Sport Facilities	1	1	1	1	1	1	NJT	NJT
Summary		Level							
		1	2	3	4	5	6	7	8
Identified Job Titles (Per Level)		38	41	42	40	35	27	0	0
Total Identified Job Titles		223							
Critical Job Titles (Per Level)		6	21	12	1	4	1	0	0
Total Critical Job Titles		49							

Job Title Relevant to Industrial Revolution and Green technology (Per Level)	0	17	18	20	24	22	0	0
Total Job Title Relevant to Industrial Revolution and Green technology	101							

4.3.2 Analysis of the Critical Jobs (CJ) in the Civil Engineering Industry

This section explains the CJ in the civil engineering industry. The findings are gathered from the FGD attended by thirteen industry panel experts as participants and a survey questionnaire administered to 270 respondents. Findings indicated that CJ in the civil engineering industry is bar bender, carpenter, welder, fitter, concreter, tunnel crew, traffic management officer, flagman, machine operator road painter, rigger, TBM operator, hoisting supervisor (tunnel), hoisting supervisor (mobile crane), hoisting supervisor (tower crane), pre & post-tensioned crew, beam launcher operation, bearing installer, joint expansion installation, noise barrier installer, parapet wall installer, bricklayer, competent schedule waste handler. In this study, CJ refers to difficult-to-fill positions; JT, the current industry needs or skills involving work processes or related technologies, refers to demand and supply in related industries. Details of CJ in the civil engineering industry gathered from the thirteen participants is shown in Table 4.18.

Table 4.18: Critical Jobs in the Civil Engineering Industry from Participants

NO.	JOB TITLES	AREA	FACTOR(S) CONTRIBUTING TO THE DEMAND	SPECIFIC REQUIREMENTS & SKILLS
1	Road Painter Supervisor & Machine Operator Road Painter	Road Line Marking	a) Require specific skills to perform the job. b) Shortage of local workers.	a) CIDB green card. b) Road marking course under CIDB
2	Construction Traffic Management Officer (CTMO)	Traffic Management (Signalling), Traffic Management (Shadow Traffic)	a) Require specific skills to perform the job. b) Shortage of local workers.	a) Graduate with Certificate / Diploma in Civil b) CIDB Construction Traffic Management Officer (CTMO)
3	Noise Barrier Supervisor & Noise Barrer Installer	Noise Barrier	a) Require specific skills to perform the job. b) Shortage of local workers.	Apply legislative, organisation and site requirements and procedures for installing noise barriers
4	Flagman	Traffic Management (Signalling)	a) Require specific skills to perform the job. b) Shortage of local workers.	a) CIDB Construction Traffic b) Management Officer (CTMO)
5	Road Drainage Bar bender & Bridge Structure Bar Benders	Road Drainage System (Reinforcement Work),	a) Require specific skills to perform the job. b) Shortage of local workers.	a) CIDB green card. b) Bar bender vocational skills and experience required.

		Bridge Structure (Reinforcement Work)	c) Perceived as a 3D job.	
6	Road Drainage Concreter, Bridge Structure Concreter	Road Drainage System (Concrete Works), Bridge Structure (Concrete Work)	a) Require specific skills to perform the job. b) Shortage of local workers. c) Perceived as a 3D job.	a) CIDB green card. Carpentry vocational skills and experience required
7	Road Drainage Carpenter	Road Drainage System (Timber Work)	a) Require specific skills to perform the job. b) Shortage of local workers. c) Perceived as a 3D job.	a) CIDB green card. b) Carpentry vocational skills and experience required.
8	Road Drainage Bricklayer, Manholes Bricklayer	Road Drainage System (Brick Work), Manholes (Brick Work)	a) Require specific skills to perform the job. b) Shortage of local workers. c) Perceived as a 3D job.	a) CIDB green card. b) Bricklayer vocational skills and experience required.
9	Steelwork Welder	Cutting / Welding (Steelwork)	a) Require specific skills to perform the job. b) Shortage of local workers. c) Experience workers prefer to work oversea or in other industries (oil & gas and shipyard)	a) CIDB green card. b) Welding competency certificate.

			which pays better.	
10	Assistant Tunnel Technician, Tunnel Crew,	Tunnel Lining, Tunnel Boring, Tunnelling Plant & Workshop	a) Require specific skills to perform the job. b) Shortage of local workers. c) Perceived as a 3D job.	a) MMC-Gamuda Joint Venture (MGJV) Tunnelling Training Academy (TTA)
11	Tunnel Technician, Hoisting Supervisor	Tunnel Lining (Segment), Tunnel Lining (Crane), Tunnel, Tunnel Boring, Tunnel Plant & Workshop, Tunnel Safety	a) Require specific skills to perform the job. b) Shortage of local workers. c) Experience workers prefer to work overseas, which more project and pays better.	a) Degree in Civil or Mining Engineering b) MMCGamuda Joint Venture (MGJV) Tunnelling Training Academy (TTA)
12	TBM Operator	Tunnel Boring	a) Require specific skills to operate machines. b) Shortage of local workers. c) Experience workers prefer to work overseas, which more project and pays better.	a) Knowledge on mechanical systems and electricity. b) MMC-Gamuda Joint Venture (MGJV) Tunnelling Training Academy (TTA)
13	ERT Foreman, ERT Crew	Tunnelling Safety	a) Require specific skills to perform the job. b) Experience workers prefer to work overseas	a) Safety and Healthcare Providers b) Firefighting, Hazardous Materials Operations, Vehicle Extrication, Emergency Vehicle Operations training

			which more projects and pays better.	
14	Beam Launcher Operator, Beam Launcher Supervisor, Beam Launcher Senior Supervisor & Site Engineer	Beam Launching	<ul style="list-style-type: none"> a) Require specific skills to perform the job. b) Shortage of local experts and takers c) Require specific skills to operate machine d) less training provider and exposure 	<ul style="list-style-type: none"> a) CIDB green card. b) Knowledge on mechanical systems and electricity.
15	Pre & Post Tensioned Senior Supervisor, Pre & Post Tensioned Supervisor, Bridge Structure Senior Supervisor, Bridge Structure Supervisor	Bridge Structure (Prestressed), Bridge Structure (Concrete Work), Bridge Structure (Rigging)	Require specific skills and experience to perform the job.	<ul style="list-style-type: none"> a) CIDB green card. b) Graduate with Certificate / Diploma in Civil
16	Bridge Structure Rigger	Bridge Structure (Rigging)	<ul style="list-style-type: none"> a) Require specific skills to perform the job. b) Shortage of local experts and takers c) Require specific skills to operate machines d) less training provider and exposure 	<ul style="list-style-type: none"> a) CIDB green card. b) Knowledge on mechanical systems and electricity.

17	Bridge Bearing Installer, Expansion Joint Installer	Bridge Bearing, Bridge Expansion Joint	<p>a) Require specific skills to perform the job.</p> <p>b) Shortage of local experts and takers</p> <p>c) less training provider and exposure</p>	CIDB green card.
18	Retaining Wall Supervisor	Retaining Wall	Require specific skills and experience to perform the job.	Graduate with Certificate / Diploma in Civil
19	Pipe Fitter I, Pipe Fitter II	Pipeline (Cutting / Joining)	<p>a) Require specific skills to perform the job.</p> <p>b) Shortage of local workers.</p> <p>c) Experience workers prefer to work oversea or in other industries (oil & gas and shipyard) which pays better.</p>	<p>a) CIDB green card.</p> <p>b) Fitter competency certificate.</p>
20	Assistant Pipe Jacking Operator	Pipeline (Jacking)	<p>a) Require specific skills to perform the job.</p> <p>b) Shortage of local workers.</p> <p>c) Experience workers prefer to work overseas or in other industries (oil & gas and shipyard), which pays better.</p>	CIDB Basic Rigging & Slingsing (BRS) course

In this study, Jobs in Demand describes the process of identifying high-demand jobs using analytical data sources. In explaining the crucial component of JT and its vital importance to Jobs in Demand gathered from findings as shown in Table 4.19, the experience of shortage and demand of manpower in the civil engineering industry is presented into three categories of Jobs in Demand in Road & Railway Field, (2) Jobs in Demand in Utility Field, and (3) Jobs in Demand in Other Field. The level of scale provided in this analysis are (1) Not in Demand, (2) Low in Demand, (3) Mid in Demand, and (4) High in Demand). The types of each Critical Job in (1) Skilled Workers, (2) Semi-Skilled Workers, and (3) Low-Skilled Workers are also presented in this analysis.

It is highlighted that Bridge Structure, Tunnel Boring, Beam Launching, Tunnel Lining, and Retaining Wall are found as the most Jobs in Demand for Construction of Roadway & Railway Areas as illustrated in Figure 4.6. While Power Supply, Water Supply, Telecommunication Tower, Traffic Management, and Concrete Precast Panel are found to be the most Jobs in Demand in Utility Projects as illustrated in Figure 4.7. Whereas, Airport/Runway, Dams/Dykes, Flood Mitigation System, Port/Harbour/Marinas, and River Works are found to be the most Jobs in Demand in Other Projects as illustrated in Figure 4.8.

Table 4.19: Jobs in Demand in the Civil Engineering Industry from Respondents

No.	Job Areas and Category of Skills	ND [%]	LD [%]	MD [%]	HD [%]
Construction of Road and Railways					
1.	Road Work (Road Base)				
	a) Skilled Workers	2.2	12.2	42.2	43.4
	b) Semi-skilled Workers	0	11.1	54.4	34.5
	c) Low-skilled Workers	2.2	22.2	47.8	27.8
2.	Premix				
	a) Skilled Workers	2.2	10.0	42.2	45.6
	b) Semi-skilled Workers	0	10.0	56.7	33.3
	c) Low-skilled Workers	2.2	26.7	40.0	31.1
3.	Road Furniture				
	a) Skilled Workers	4.4	16.7	43.3	35.6
	b) Semi-skilled Workers	2.2	17.8	53.3	26.7

	c) Low-skilled Workers	2.2	22.2	52.2	23.4
4.	Road Line Marking				
	a) Skilled Workers	6.7	20.0	37.8	35.5
	b) Semi-skilled Workers	2.2	25.6	47.8	24.4
	c) Low-skilled Workers	3.3	30.0	44.4	22.3
5.	Traffic Management				
	a) Skilled Workers	5.6	12.2	24.4	57.8
	b) Semi-skilled Workers	3.3	14.4	55.6	26.7
	c) Low-skilled Workers	6.7	28.9	45.6	18.8
6.	Retaining Wall				
	a) Skilled Workers	2.2	7.8	25.6	64.4
	b) Semi-skilled Workers	1.1	9.0	53.3	35.6
	c) Low-skilled Workers	3.3	30.0	42.2	24.5
7.	Slope Protection				
	a) Skilled Workers	2.2	8.9	30.0	58.9
	b) Semi-skilled Workers	1.1	10.0	52.2	36.7
	c) Low-skilled Workers	5.6	26.7	42.2	25.6
8.	Installation (Steelwork)				
	a) Skilled Workers	4.4	4.4	31.1	60.1
	b) Semi-skilled Workers	1.1	7.8	50.0	41.1
	c) Low-skilled Workers	5.6	22.2	43.3	28.9
9.	Cutting / Welding (Steelwork)				
	a) Skilled Workers	4.4	14.4	24.4	56.8
	b) Semi-skilled Workers	2.2	14.4	44.4	39.0
	c) Low-skilled Workers	5.6	25.6	43.3	25.5
10.	Grouting				
	a) Skilled Workers	3.3	14.4	35.6	46.7
	b) Semi-skilled Workers	2.2	17.8	51.1	28.9
	c) Low-skilled Workers	10.0	26.7	41.1	22.2
11.	Tunnel Lining				
	a) Skilled Workers	2.2	8.9	22.2	66.7
	b) Semi-skilled Workers	1.1	14.4	40.0	44.5

	c) Low-skilled Workers	6.7	34.4	33.3	25.6
12.	Tunnel Boring				
	a) Skilled Workers	4.4	8.90	13.3	73.4
	b) Semi-skilled Workers	3.3	13.3	38.9	44.5
	c) Low-skilled Workers	7.8	33.3	30.0	28.9
13.	Tunnelling Safety				
	a) Skilled Workers	2.2	7.8	24.4	65.6
	b) Semi-skilled Workers	1.1	14.4	44.4	40.1
	c) Low-skilled Workers	8.9	31.1	34.4	25.6
14.	Tunnelling Plant & Workshop				
	a) Skilled Workers	3.3	11.1	32.2	53.4
	b) Semi-skilled Workers	2.2	14.4	47.8	35.6
	c) Low-skilled Workers	7.8	28.9	41.1	22.2
15.	Bridge Structure				
	a) Skilled Workers	1.1	6.7	15.6	76.6
	b) Semi-skilled Workers	1.1	8.9	48.9	41.1
	c) Low-skilled Workers	3.3	28.9	45.6	22.2
16.	Drainage System				
	a) Skilled Workers	3.3	13.4	34.4	48.9
	b) Semi-skilled Workers	3.3	12.2	56.7	27.8
	c) Low-skilled Workers	4.4	26.7	43.3	25.6
17.	Beam Launching				
	a) Skilled Workers	3.3	6.7	22.2	67.8
	b) Semi-skilled Workers	2.2	7.8	43.3	46.7
	c) Low-skilled Workers	6.7	28.9	36.6	27.8
Construction of Utility Projects					
1.	Pipe Work				
	a) Skilled Workers	4.4	7.8	45.6	42.2
	b) Semi-skilled Workers	2.2	8.9	56.7	32.2
	c) Low-skilled Workers	3.3	26.7	43.3	26.7
2.	Concrete Precast Panel				
	a) Skilled Workers	4.5	8.9	34.4	52.2

	b) Semi-skilled Workers	3.3	12.2	45.6	38.9
	c) Low-skilled Workers	5.6	26.7	44.4	23.3
3.	Brick Manhole				
	a) Skilled Workers	5.6	23.3	35.5	35.6
	b) Semi-skilled Workers	3.3	17.8	45.6	33.3
	c) Low-skilled Workers	8.9	24.4	40.0	26.7
4.	Traffic Management				
	a) Skilled Workers	6.7	10.0	31.1	52.2
	b) Semi-skilled Workers	3.3	15.6	50.0	31.1
	c) Low-skilled Workers	7.8	31.1	43.3	17.8
5.	Drainage				
	a) Skilled Workers	2.2	15.6	38.9	43.3
	b) Semi-skilled Workers	1.1	14.4	56.7	27.8
	c) Low-skilled Workers	5.6	25.5	43.3	25.6
6.	Telecommunication Tower				
	a) Skilled Workers	3.3	12.2	30.0	54.5
	b) Semi-skilled Workers	1.2	14.4	50.0	34.4
	c) Low-skilled Workers	4.4	35.6	35.6	24.4
7.	Power Supply				
	a) Skilled Workers	1.1	6.7	26.7	65.5
	b) Semi-skilled Workers	1.2	10.0	44.4	44.4
	c) Low-skilled Workers	3.3	31.1	40.0	25.6
8.	Water Supply				
	a) Skilled Workers	2.2	6.7	36.7	54.4
	b) Semi-skilled Workers	1.1	12.2	50.0	36.7
	c) Low-skilled Workers	7.8	21.1	44.4	26.7
9.	Sewerage				
	a) Skilled Workers	1.1	10.0	37.8	51.1
	b) Semi-skilled Workers	2.2	16.7	43.3	37.8
	c) Low-skilled Workers	4.4	24.4	41.2	30.0
Construction of Other Civil Engineering Projects					
1.	Port / Harbor / Marinas				

	a) Skilled Workers	6.7	7.8	33.3	52.2
	b) Semi-skilled Workers	5.6	15.6	50.0	28.8
	c) Low-skilled Workers	8.9	26.7	40.0	24.4
2.	Airport / Runway				
	a) Skilled Workers	6.7	11.1	25.6	56.6
	b) Semi-skilled Workers	5.6	13.3	44.4	36.7
	c) Low-skilled Workers	11.1	25.6	36.7	26.6
3.	Flood Mitigation System				
	a) Skilled Workers	6.7	8.9	30.0	54.4
	b) Semi-skilled Workers	6.7	17.8	37.8	37.8
	c) Low-skilled Workers	10.0	26.7	38.9	24.4
4.	Dams / Dykes				
	a) Skilled Workers	5.60	8.90	31.1	54.4
	b) Semi-skilled Workers	4.4	17.8	38.9	38.9
	c) Low-skilled Workers	8.9	25.6	37.8	27.7
5.	River Works				
	a) Skilled Workers	4.4	7.8	45.6	42.2
	b) Semi-skilled Workers	4.4	17.8	50.0	27.8
	c) Low-skilled Workers	10.0	23.3	43.3	23.4
6.	Sport Facilities				
	a) Skilled Workers	6.7	15.6	41.0	36.7
	b) Semi-skilled Workers	5.6	18.9	47.8	27.7
	c) Low-skilled Workers	11.1	23.3	47.8	17.8

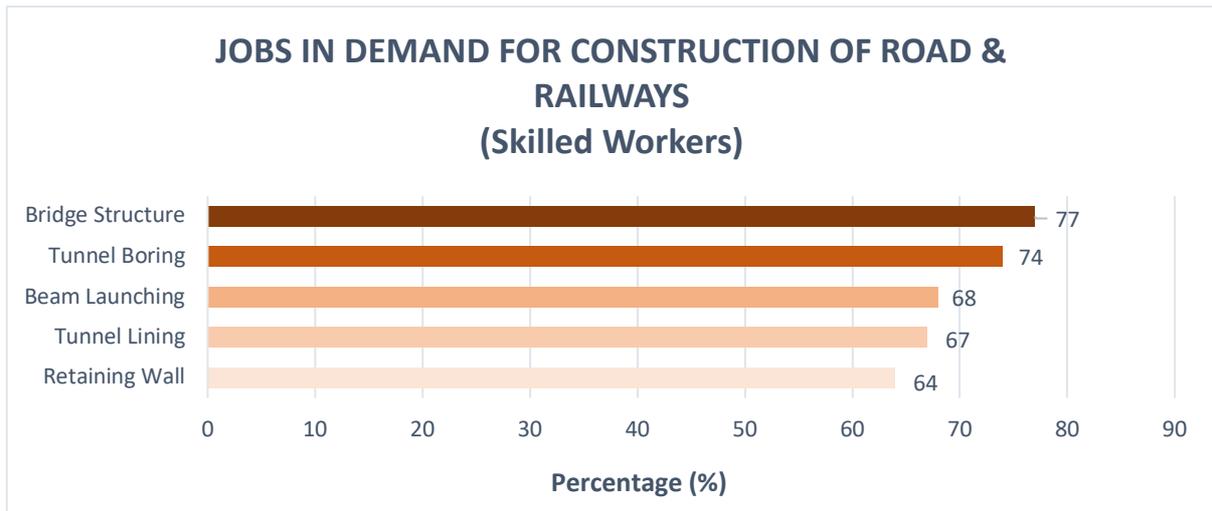


Figure 4.6: Jobs in Demand for Construction of Road & Railways (Skilled Worker)

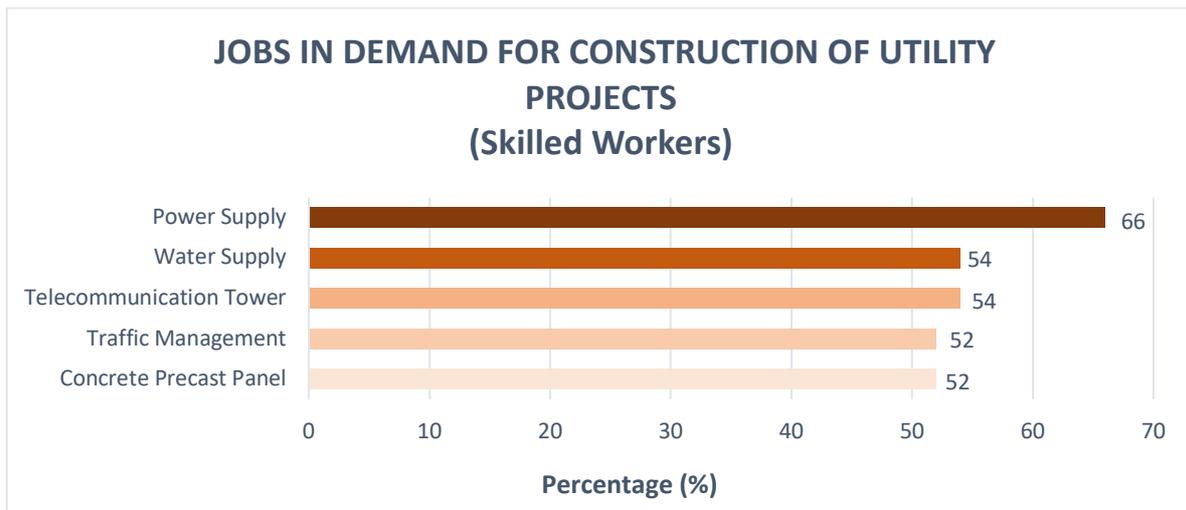


Figure 4.7: Jobs in Demand for Construction of Utility Projects (Skilled Worker)

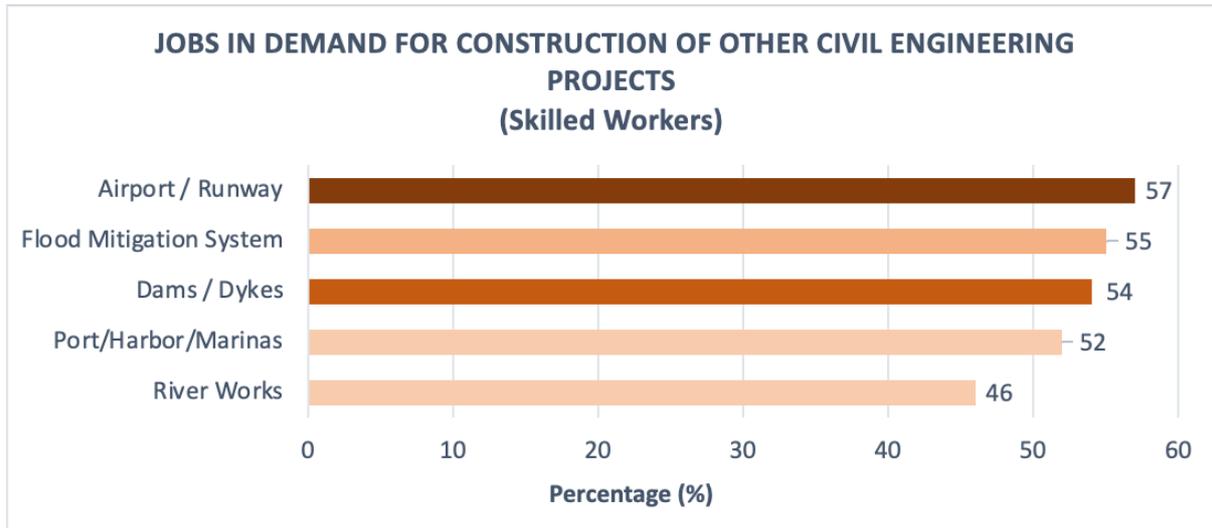


Figure 4.8: Jobs in Demand for Construction of Other Civil Engineering Projects (Skilled Worker)

4.3.3 Analysis of the Occupational Description (OD) for Each Job Title based on the Latest Industry of OF

This section explains the list of OD in the civil engineering industry. FGD is conducted with thirteen participants of industry panels, and surveys are distributed to 270 respondents. OD in this study is designed based on the list of Critical Jobs. Prior to the development of OD, the list of Occupational Competencies (OC) that resulted from the FGD are listed distinctively. The list of OC is presented in Table 4.20 to 4.33 and listed in Annex 9.

Table 4.20: Group 421 Occupational Competencies (1 of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	Road Work	Road Line Marking	Road Furniture
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with a various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor the execution 	No Job Title	No Job Title

	<p>of procedure/work sequence for the project.</p> <p>7) Inspect or review project deliverables to monitor compliance with the requirement.</p> <p>8) Liaise and coordinate with a consultant for submission to the local authority for approval.</p> <p>9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction work.</p> <p>10) Participate in the construction management process for the smooth progress of construction works.</p> <p>11) Coordinate constructions work according to Inspection Test Plan.</p> <p>12) Ensure SHE compliance.</p> <p>13) Represent the company in meetings.</p>		
LEVEL 5	<p><u>Site Engineer</u></p> <p>1) Plan, schedule, or coordinate site activities to meet deadlines.</p> <p>2) Prepare project costing and request budget estimates.</p> <p>3) Inspect or review project deliverables to monitor compliance with the requirement</p> <p>4) Monitor work progress.</p> <p>5) Plan and organise construction maintenance activities.</p>	No Job Title	No Job Title

	<ul style="list-style-type: none"> 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor the execution of procedure/work sequence for the project. 8) Prepare masterwork program/project milestone. 9) Direct and supervise construction contractor, sub-contractor, or related worker. 10) Identify and report any errors or discrepancies on construction drawings/shop drawings. 11) Propose a technical solution to resolve discrepancies on construction drawing/shop drawing/value engineering. 12) 2)Develop or implement quality control and environmental protection programme. 13) 3)Prepare progress claims for construction work. 14) 4)Prepare variation order. 15) 5) Analyse and verify submission by coordinator. 16) Attend technical and site meetings. 17) Produce as-built drawings. 		
<p>LEVEL 4</p>	<p><u>Road Construction Senior Supervisor</u></p>	<p>No Job Title</p>	<p><u>Road Furniture Senior Supervisor</u> 1) Reporting to Construction Manager.</p>

	<ol style="list-style-type: none"> 1) Reporting to the Construction Manager. 2) Day-to-day management of the site, including supervising and monitoring the site labour force and the work of any sub-contractors to ensure within time and quality. 3) Planning the work and efficiently organising the plant and site facilities to meet agreed-to deadlines. 4) Liaise with consultants on all site matters, e.g., timely issuance of construction drawings, follow up on drawings, amendments, etc. 5) Observe and ensure all equipment and procedures comply with safety regulations. 6) Coordinates with sub-contractors on details, sequence, and programme of works. 7) Ensuring that all materials used are within budgeted quantity and work performed are as per specifications. 8) Measurement and valuation in collaboration with Contracts Department where appropriate, providing data in respect of variation orders and site instructions. 		<ol style="list-style-type: none"> 2) Day-to-day management of the site, including supervising and monitoring the site labour force and the work of any sub-contractors to ensure within time and quality. 3) Planning the work and efficiently organising the plant and site facilities to meet agreed on deadlines. 4) Liaise with consultants on all site matters, e.g., timely issuance of construction drawings, follow up on drawings, amendments, etc. 5) Observe and ensure all equipment and procedures comply with safety regulations. 6) Coordinates with sub-contractors on details, sequence, and programme of works. 7) Ensuring that all materials used are within budgeted quantity and work performed are as per specifications. 8) Measurement and valuation in collaboration with Contracts Department where appropriate, providing data in respect of variation orders and site instructions.
<p>LEVEL 3</p>	<p><u>Road Construction & Maintenance Supervisor</u></p>	<p><u>Road Painter Supervisor</u></p> <ol style="list-style-type: none"> 1) Take photos before and after the job is done. 	<p><u>Road Furniture Supervisor</u></p> <ol style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade.

	<ol style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc.) to determine work requirements. 6) Coordinate work activities. 7) Monitor usage of equipment on construction sites to verify safety and specification compliance. 8) Carry out regular work inspections. 9) Identify and request the required materials, manpower and machinery. 10) Attend technical and site meetings. 11) Compile site documents or records to prepare a report. 12) Raise site safety concerns and identify construction hazards and risks. 13) Report site matters to superior or management. 14) Supervise subordinate work. 15) Supervise compliance of safety, health, and environment requirements. 16) Arrange for maintenance activities. 17) Perform subordinate appraisal. 	<ol style="list-style-type: none"> 2) Applying thermoplastic paint using mould 10, 15, 20, 30, 50, 70 cms. 3) Supervise hand marking team such as boiler and bucket man, glass beads and masking tape removal helper. 4) Take measurement of the completed job. 5) Applies paint for new traffic lines and repaints existing traffic lines. 6) Cleans out paint guns and valves. 7) Lays out new markings according to drawings. Records information associated with the specific tasks carried out. 8) Completes pre-trip inspection of the equipment as per procedures. 9) Ensures that City, Provincial and National regulations are followed. 10) Provides direction for those working with the equipment. 11) Assists other crew members in performing their duties. 12) Performs routine maintenance tasks 13) Keeps records. 14) Drives a city vehicle to and from work sites. 15) Responds to inquiries from the public. 16) Performs other job-related duties as assigned. 17) Understands and effectively carries out oral and written instructions. 	<ol style="list-style-type: none"> 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc.) to determine work requirements. 6) Coordinate work activities. 7) Monitor usage of equipment on construction sites to verify safety and specification compliance. 8) Carry out regular work inspections. 9) Identify and request the required materials, manpower and machinery. 10) Attend technical and site meetings. 11) Compile site documents or records to prepare a report. 12) Raise site safety concerns and identify construction hazards and risks. 13) Report site matters to superior or management. 14) Supervise subordinate work. 15) Supervise compliance of safety, health, and environment requirements. 16) Arrange for maintenance activities. 17) Perform subordinate appraisal. 18) Conduct training for construction methods, operation of machinery and equipment, site safety requirements.
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	<p>18) Conduct training for construction methods, operation of machinery and equipment, site safety requirements.</p> <p>19) Troubleshoot and rectify within work scope.</p> <p>20) Prepare and compile reports for site activities, including QA QC documents, SHE documents.</p>	<p>18) Deals effectively with the public. Demonstrates independence of judgment and action in performing the duties of the position.</p> <p>19) Operates a centre line marking machine and other line marking equipment.</p> <p>20) Works from maps and drawings.</p> <p>21) Maintains records.</p> <p>22) Provides direction to staff.</p> <p>23) Considerable knowledge of equipment, methods, techniques, hand/power tools in line marking.</p> <p>24) Knowledge of standard road systems</p> <p>25) Knowledge of types of paints, application techniques and necessary safety precautions.</p> <p>26) Knowledge of the design regulations of traffic lines, etc.</p> <p>27) Knowledge of road policies, procedures & standards.</p> <p>28) Knowledge of applicable safety regulations.</p> <p>29) Physical coordination is necessary to carry out the duties of the position.</p>	<p>19) Troubleshoot and rectify within work scope.</p> <p>20) Prepare and compile reports for site activities, including QA QC documents, SHE documents.</p>
LEVEL 2	<p><u>Road Construction Operation</u></p> <p>1) Operate tools, equipment, and machinery.</p> <p>2) Carry out construction works according to instruction and drawing.</p>	<p><u>Machine Operator Road Painter</u></p> <p>1) Operate tools, equipment, and machinery.</p> <p>2) Carry out construction works according to instruction and drawing.</p>	<p><u>Road Furniture Installer</u></p> <p>1) Load and unload the truck</p> <p>2) Install furniture according to blueprints or job tickets</p> <p>3) Prep and clean up the job site</p> <p>4) Assemble furniture as needed</p>

	<ul style="list-style-type: none"> 3) Carry out routine maintenance in accordance with the routine schedule. 4) Perform loading and unloading activities of materials. 5) Perform housekeeping. 6) Adhere to safety, health, and environmental regulation. 	<ul style="list-style-type: none"> 3) Carry out routine maintenance in accordance with the routine schedule. 4) Perform loading and unloading activities of materials. 5) Perform housekeeping. 6) Adhere to safety, health, and environmental regulation. 	<ul style="list-style-type: none"> 5) Maintain a safe and clean workspace
LEVEL 1	<p><u>General Workers</u></p> <ul style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist in routine maintenance in accordance with the routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist in controlling the flow of traffic passing near, in or around the worksite. 7) Perform housekeeping. 8) Adhere to safety, health and environmental regulation. 	<p><u>General Workers</u></p> <ul style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist in routine maintenance in accordance with the routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist in controlling the flow of traffic passing near, in or around the worksite. 7) Perform housekeeping. 8) Adhere to safety, health and environmental regulation. 	<p><u>General Workers</u></p> <ul style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist in routine maintenance in accordance with the routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist in controlling the flow of traffic passing near, in or around the worksite. 7) Perform housekeeping. 8) Adhere to safety, health and environmental regulation.

Table 4.21: Group 421 Occupational Competencies (2 of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	Noise Barrer	Traffic Management (Shadow Traffic)	Traffic Management (Signalling)
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	No Job Title	<p><u>Traffic Manager</u></p> <ol style="list-style-type: none"> 1) Monitor and provide advice to the site project team. 2) Communicate and coordinate with client, government, and utility agencies 3) Technical Coordination with authorities such as traffic management, road safety division and other related authority entities. 4) Planning, scheduling, and managing of all aspects of traffic work for MRT project 5) Design review traffic control plan and traffic impact assessment in compliance with LTA CDC, SDRE, Code of Practice for street work and authority requirements. 6) Coordinate with consultants, sub-contractors, and project site operation 	<p><u>Traffic Manager</u></p> <ol style="list-style-type: none"> 1) Monitor and provide advice to the site project team. 2) Communicate and coordinate with client, government, and utility agencies 3) Technical Coordination with authorities such as traffic management, road safety division and other related authority entities. 4) Planning, scheduling, and managing of all aspects of traffic work for MRT project 5) Design review traffic control plan and traffic impact assessment in compliance with LTA CDC, SDRE, Code of Practice for street work and authority requirements. 6) Coordinate with consultants, sub-contractors, and project site operation

		<p>team to facilitate installation works and progress on site</p> <p>7) Understand ERSS construction sequence</p>	<p>team to facilitate installation works and progress on site</p> <p>7) Understand ERSS construction sequence</p>
LEVEL 5	No Job Title	<p><u>Construction Traffic Management Officer (CTMO)</u></p> <p>1) To organise and supervise a team of workers to carry out traffic management activities.</p> <p>2) To liaise with the client and local authorities on site matters related to traffic management.</p> <p>3) To manage all traffic management equipment on site.</p> <p>4) To prepare a report for traffic management.</p> <p>5) To convey information about the progress of the project to the Traffic Management Officer or Managers.</p> <p>6) To undertake all other duties and responsibilities as so instructed by the superior.</p>	<p><u>Construction Traffic Management Officer (CTMO)</u></p> <p>1) To organise and supervise a team of workers to carry out traffic management activities.</p> <p>2) To liaise with the client and local authorities on site matters related to traffic management.</p> <p>3) To manage all traffic management equipment on site.</p> <p>4) To prepare a report for traffic management.</p> <p>5) To convey information about the progress of the project to the Traffic Management Officer or Managers.</p> <p>6) To undertake all other duties and responsibilities as so instructed by the superior.</p>
LEVEL 4	<p><u>Noise Barrer Senior Supervisor</u></p> <p>1) Access, interpret and apply compliance documentation relevant to the work activity.</p> <p>2) Identify and apply relevant drawings and job specifications to all work activities.</p>	<p><u>Traffic supervisor</u></p> <p>1) Monitor traffic control operations and road closures.</p> <p>2) Prepare and arrange signboards as instructed by the traffic management officer.</p> <p>3) Patrol at the workplace periodically.</p>	<p><u>Traffic supervisor</u></p> <p>1) Monitor traffic control operations and road closures.</p> <p>2) Prepare and arrange signboards as instructed by the traffic management officer.</p> <p>3) Patrol at the workplace periodically.</p>

	<p>3) Obtain and confirm safety requirements from the site safety plan and organisational policies and procedures, and apply to the allotted task</p> <p>4) Identify, obtain, and implement signage requirements from the project traffic management plan. Select plant, tools and equipment to carry out tasks consistent with the requirements of the job, check for serviceability and rectify or report any faults. Identify environmental protection requirements from the project environmental management plan, and confirm and apply to the allotted task.</p>	<p>4) Always inspect traffic equipment such as signboards, barriers and etc</p> <p>5) Monitor employees</p>	<p>4) Always inspect traffic equipment such as signboards, barriers and etc</p> <p>5) Monitor employees</p>
<p>LEVEL 3</p>	<p><u>Noise Barrer Supervisor</u></p> <p>1) Collaborates with a team to develop active, noise-cancelling equipment and materials such as headphones.</p> <p>2) Analyses noise control systems to determine effectiveness by measuring actual sound reduction.</p> <p>3) Reads and interprets technical drawings and</p> <p>4) Review results, comparing data with designs and materials currently used.</p>	<p><u>Traffic Controller</u></p> <p>1) Sets up, manages, and removes temporary traffic control schemes/signs</p> <p>2) Directs vehicular and pedestrian traffic around construction zones, accidents, or other road disruptions, ensuring the safety of emergency response teams, construction workers and the general public.</p> <p>3) Handles a Stop-Slow sign, or manages other similar traffic control signs and devices, to direct traffic.</p>	<p><u>Traffic Controller</u></p> <p>1) Sets up, manages, and removes temporary traffic control schemes/signs</p> <p>2) Directs vehicular and pedestrian traffic around construction zones, accidents, or other road disruptions, ensuring the safety of emergency response teams, construction workers and the general public.</p> <p>3) Handles a Stop-Slow sign, or manages other similar traffic control signs and devices, to direct traffic.</p>

	<ul style="list-style-type: none"> 5) Estimates the cost of alternative designs or materials and compares the feasibility of those alternatives. 6) Performs other related duties as assigned. 	<ul style="list-style-type: none"> 4) Communicate with other road traffic personnel, construction workers and emergency response teams via radio to provide and receive updates on traffic conditions. 5) Completes site checks and monitors traffic behaviour and/or flow to ensure safety is always maintained. 6) Takes instructions from crew leaders, foremen, managers, inspectors, auditors, or officials. 	<ul style="list-style-type: none"> 4) Communicate with other road traffic personnel, construction workers and emergency response teams via radio to provide and receive updates on traffic conditions. 5) Completes site checks and monitors traffic behaviour and/or flow to ensure safety is always maintained. 6) Takes instructions from crew leaders, foremen, managers, inspectors, auditors, or officials.
<p>LEVEL 2</p>	<p><u>Noise Barrer Installer</u></p> <ul style="list-style-type: none"> 1) Set out the position of noise barrier line and post holes, and excavate to specifications 2) Install base section 3) Install uprights plumb and to alignment 4) Fit and fix rails, cladding or panels 5) Clear work area and recycle or dispose of materials in accordance with project environmental management plan 6) Store and stack unused materials 7) Clean, check, maintain and store plant, tools, and equipment 	<p><u>Shadow Vehicle Driver</u></p> <ul style="list-style-type: none"> 1) Drive shadow vehicle, which is a moving truck with attenuators spaced a short distance from a moving operation, giving physical protection to workers from traffic approaching from the rear. 2) Use trailer-mounted attenuators on the shadow vehicle on a project-specific basis to protect workers. 3) Warn road users of downstream work activity by using appropriate signs and warning lights. 7) Warn approaching drivers that the shoulder or travel lane is occupied by work activities and that the driver must move into the adjoining open lane. 	<p><u>Flagman</u></p> <ul style="list-style-type: none"> 1) Help vehicles move safely in their work areas. 2) Help the drivers and operators in avoiding hazards and accidents occurrence. 3) Ensure the safety of workers on site 4) Controlling the operation of vehicles on-site and ensuring safe parking 5) Control the movement of excavator, tipper truck, grader, bulldozer, and other vehicles on site 6) Ensuring safe distance from rotating equipment and excavation edges by giving signals

<p>LEVEL 1</p>	<p><u>General Workers</u> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist in routine maintenance in accordance with the routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist in controlling the flow of traffic passing near, in or around the worksite. 7) Perform housekeeping. 8) Adhere to safety, health and environmental regulation.</p>	<p><u>General Workers</u> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist in routine maintenance in accordance with the routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist in controlling the flow of traffic passing near, in or around the worksite. 7) Perform housekeeping. 9) Adhere to safety, health and environmental regulation.</p>	<p><u>General Workers</u> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist in routine maintenance in accordance with the routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist in controlling the flow of traffic passing near, in or around the worksite. 7) Perform housekeeping. 8) Adhere to safety, health and environmental regulation.</p>
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Table 4.22: Group 421 Occupational Competencies (3 of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	Road Drainage System (Reinforcement Work)	Road Drainage System (Concrete Works)	Road Drainage System (Timber Work)
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	No Job Title	No Job Title	No Job Title
LEVEL 5	<p><u>Site Engineer</u></p> <ol style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with the requirement 4) Monitor work progress. 5) Plan and organise construction maintenance activities. 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor the 	<p><u>Site Engineer</u></p> <ol style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with the requirement 4) Monitor work progress. 5) Plan and organise construction maintenance activities. 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor the execution of procedure/work sequence for the project. 	<p><u>Site Engineer</u></p> <ol style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with the requirement 4) Monitor work progress. 5) Plan and organise construction maintenance activities. 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor the execution of procedure/work sequence for the project.

	<p>execution of procedure/work sequence for the project.</p> <p>8) Prepare masterwork program/ project milestone.</p> <p>9) Direct and supervise construction contractor, sub-contractor, or related worker.</p> <p>10) Identify and report any errors or discrepancies on construction drawings/shop drawings.</p> <p>11) Propose a technical solution to resolve discrepancies on construction drawing/shop drawing/value engineering.</p> <p>12) Develop or implement quality control and environmental protection programme.</p> <p>13) Prepare progress claim for construction work.</p> <p>14) Prepare variation order.</p> <p>15) Analyse and verify submission by the coordinator.</p> <p>16) Attend technical and site meetings.</p> <p>17) Produce as-built drawings.</p>	<p>8) Prepare masterwork program/ project milestone.</p> <p>9) Direct and supervise construction contractor, sub-contractor, or related worker.</p> <p>10) Identify and report any errors or discrepancies on construction drawings/shop drawings.</p> <p>11) Propose a technical solution to resolve discrepancies on construction drawing/shop drawing/value engineering.</p> <p>12) Develop or implement quality control and environmental protection programme.</p> <p>13) Prepare progress claim for construction work.</p> <p>14) Prepare variation order.</p> <p>15) Analyse and verify submission by the coordinator.</p> <p>16) Attend technical and site meetings.</p> <p>17) Produce as-built drawings.</p>	<p>8) Prepare masterwork program/ project milestone.</p> <p>9) Direct and supervise construction contractor, sub-contractor, or related worker.</p> <p>10) Identify and report any errors or discrepancies on construction drawings/shop drawings.</p> <p>11) Propose a technical solution to resolve discrepancies on construction drawing/shop drawing/value engineering.</p> <p>12) Develop or implement quality control and environmental protection programme.</p> <p>13) Prepare progress claim for construction work.</p> <p>14) Prepare variation order.</p> <p>15) Analyse and verify submission by the coordinator.</p> <p>16) Attend technical and site meetings.</p> <p>17) Produce as-built drawings.</p>
<p>LEVEL 4</p>	<p><u>Road Drainage Senior Supervisor</u></p> <p>1) Act as the primary interface with internal Project Manager and Discipline leads and supervise all Drainage/Hydrology aspects of</p>	<p><u>Road Drainage Senior Supervisor</u></p> <p>1) Act as the primary interface with internal Project Manager and Discipline leads and supervise all Drainage/Hydrology aspects of major Transportation projects with</p>	<p><u>Road Drainage Senior Supervisor</u></p> <p>1) Act as the primary interface with internal Project Manager and Discipline leads and supervise all Drainage/Hydrology aspects of major Transportation projects with the</p>

	<p>major Transportation projects with the clients and contractors on both conventional and design/build projects.</p> <ol style="list-style-type: none"> 2) A key member of Road/Highway Practice to assist in executing projects 3) Responsible for developing the drainage scope and fee and providing staffing for project assignments, both large and small. Projects may include hydrologic analysis, inlet design, storm sewer design, ditch and channel design, cross drain design, retention/detention basin design, and bridge hydraulics. 4) Act as a leader to demonstrate excellent design expertise in these areas, as well as mentor and lead engineers in the preparation of plan documents and reports, such as storm-water plans, drainage criteria documentation, drainage design reports, and hydraulic bridge reports. 5) Responsible for overseeing the civil design team's technical deliverables and meeting project schedules from design 	<p>the clients and contractors on both conventional and design/build projects.</p> <ol style="list-style-type: none"> 2) A key member of Road/Highway Practice to assist in executing projects 3) Responsible for developing the drainage scope and fee and providing staffing for project assignments, both large and small. Projects may include hydrologic analysis, inlet design, storm sewer design, ditch and channel design, cross drain design, retention/detention basin design, and bridge hydraulics. 4) Act as a leader to demonstrate excellent design expertise in these areas, as well as mentor and lead engineers in the preparation of plan documents and reports, such as storm-water plans, drainage criteria documentation, drainage design reports, and hydraulic bridge reports. 5) Responsible for overseeing the civil design team's technical deliverables and meeting project schedules from design through construction, as necessary. 	<p>clients and contractors on both conventional and design/build projects.</p> <ol style="list-style-type: none"> 2) A key member of Road/Highway Practice to assist in executing projects 3) Responsible for developing the drainage scope and fee and providing staffing for project assignments, both large and small. Projects may include hydrologic analysis, inlet design, storm sewer design, ditch and channel design, cross drain design, retention/detention basin design, and bridge hydraulics. 4) Act as a leader to demonstrate excellent design expertise in these areas, as well as mentor and lead engineers in the preparation of plan documents and reports, such as storm-water plans, drainage criteria documentation, drainage design reports, and hydraulic bridge reports. 5) Responsible for overseeing the civil design team's technical deliverables and meeting project schedules from design through construction, as necessary. 6) Ensure the highest quality of engineering is put forth to meet all design criteria requirements. 7) Reviews work produced to ensure that applicable codes, standards, and
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	<p>through construction, as necessary.</p> <p>6) Ensure the highest quality of engineering is put forth to meet all design criteria requirements.</p> <p>7) Reviews work produced to ensure that applicable codes, standards, and procedures are followed and quality is acceptable.</p> <p>8) Supervises the production of project drawings and design calculations.</p> <p>9) Promotes technical excellence on the project, including furthering the Quality Improvement Process.</p> <p>10) Ensures that adequate checking is performed in accordance with discipline checking policy and procedures.</p> <p>11) Ensures that discipline design work is coordinated with project staff and Engineers from other disciplines by maintaining clear and frequent communications.</p> <p>12) Maintains affiliation with professional societies to keep abreast of current technologies.</p>	<p>6) Ensure the highest quality of engineering is put forth to meet all design criteria requirements.</p> <p>7) Reviews work produced to ensure that applicable codes, standards, and procedures are followed and quality is acceptable.</p> <p>8) Supervises the production of project drawings and design calculations.</p> <p>9) Promotes technical excellence on the project, including furthering the Quality Improvement Process.</p> <p>10) Ensures that adequate checking is performed in accordance with discipline checking policy and procedures.</p> <p>11) Ensures that discipline design work is coordinated with project staff and Engineers from other disciplines by maintaining clear and frequent communications.</p> <p>12) Maintains affiliation with professional societies to keep abreast of current technologies.</p> <p>13) Performs other responsibilities associated with this position as may be appropriate.</p>	<p>procedures are followed and quality is acceptable.</p> <p>8) Supervises the production of project drawings and design calculations.</p> <p>9) Promotes technical excellence on the project, including furthering the Quality Improvement Process.</p> <p>10) Ensures that adequate checking is performed in accordance with discipline checking policy and procedures.</p> <p>11) Ensures that discipline design work is coordinated with project staff and Engineers from other disciplines by maintaining clear and frequent communications.</p> <p>12) Maintains affiliation with professional societies to keep abreast of current technologies.</p> <p>13) Performs other responsibilities associated with this position as may be appropriate.</p>
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	<p>13) Performs other responsibilities associated with this position as may be appropriate.</p>		
<p>LEVEL 3</p>	<p><u>Road Drainage Supervisor</u></p> <ol style="list-style-type: none"> 1) Monitor construction activities on-site to ensure finished work is in accordance with design, drawings, specifications, and Employer's requirements. 2) Manage the production of as-built records from site works. 3) Ensure that all works are undertaken with regard to CDM regulations and programs. 4) To ensure that the contractors are delivering quality services in compliance with specifications through maintaining adequate site inspection records to address non-compliance issues and resulting remedial actions. 5) To liaise with, where appropriate, other agencies and bodies and internal departments to ensure the site works are coordinated and projects are delivered to the programme. 6) Ensure that comprehensible method statements and risk assessments are available to and understood by those 	<p><u>Road Drainage Supervisor</u></p> <ol style="list-style-type: none"> 1) Monitor construction activities on-site to ensure finished work is in accordance with design, drawings, specifications, and Employer's requirements. 2) Manage the production of as-built records from site works. 3) Ensure that all works are undertaken with regard to CDM regulations and programs. 4) To ensure that the contractors are delivering quality services in compliance with specifications through maintaining adequate site inspection records to address non-compliance issues and resulting remedial actions. 5) To liaise with, where appropriate, other agencies and bodies and internal departments to ensure the site works are coordinated and projects are delivered to the programme. 6) Ensure that comprehensible method statements and risk assessments are available to and understood by those undertaking works and that the requirements are implemented. 	<p><u>Road Drainage Supervisor</u></p> <ol style="list-style-type: none"> 1) Monitor construction activities on-site to ensure finished work is in accordance with design, drawings, specifications, and Employer's requirements. 2) Manage the production of as-built records from site works. 3) Ensure that all works are undertaken with regard to CDM regulations and programs. 4) To ensure that the contractors are delivering quality services in compliance with specifications through maintaining adequate site inspection records to address non-compliance issues and resulting remedial actions. 5) To liaise with, where appropriate, other agencies and bodies and internal departments to ensure the site works are coordinated and projects are delivered to the programme. 6) Ensure that comprehensible method statements and risk assessments are available to and understood by those undertaking works and that the requirements are implemented.

	<p>undertaking works and that the requirements are implemented.</p> <p>7) Ensure those safe systems of work are followed, including the work of other contractors or subcontractors.</p> <p>8) Ensure all employees and or contractors under your control are competent and adequately trained in health, safety, and environment in the operation of plant and equipment and the processes involved in the workplace.</p> <p>9) Ensure that all operatives receive the relevant daily ‘start of shift ‘briefings prior to starting work and that regular "toolbox talks" relevant to current/future site activities take place.</p> <p>10) Co-operate with the SHE Manager to achieve the aims of the SHE policies, procedures, and statutory requirements and upon his recommendations.</p>	<p>7) Ensure those safe systems of work are followed, including the work of other contractors or subcontractors.</p> <p>8) Ensure all employees and or contractors under your control are competent and adequately trained in health, safety, and environment in the operation of plant and equipment and the processes involved in the workplace.</p> <p>9) Ensure that all operatives receive the relevant daily ‘start of shift ‘briefings prior to starting work and that regular "toolbox talks" relevant to current/future site activities take place.</p> <p>10) Co-operate with the SHE Manager to achieve the aims of the SHE policies, procedures, and statutory requirements and upon his recommendations.</p>	<p>7) Ensure those safe systems of work are followed, including the work of other contractors or subcontractors.</p> <p>8) Ensure all employees and or contractors under your control are competent and adequately trained in health, safety, and environment in the operation of plant and equipment and the processes involved in the workplace.</p> <p>9) Ensure that all operatives receive the relevant daily ‘start of shift ‘briefings prior to starting work and that regular "toolbox talks" relevant to current/future site activities take place.</p> <p>10) Co-operate with the SHE Manager to achieve the aims of the SHE policies, procedures, and statutory requirements and upon his recommendations.</p>
<p>LEVEL 2</p>	<p><u>Road Drainage Bar Bender</u></p> <p>1) Request for reinforcement bar storage area.</p>	<p><u>Road Drainage Concreter</u></p> <p>1) Perform work as per construction drawing and method statement.</p> <p>2) Carry out concreting work.</p>	<p><u>Road Drainage Carpenter</u></p> <p>1) Perform work as per method statement</p> <p>2) Carry out timber work.</p> <p>3) Measure, mark, or record measurements.</p>

	<ol style="list-style-type: none"> 2) Maintain and upkeep hand tools, reinforcement bar and bar bending machine. 3) Prepare bar bending workbench. 4) Prepare reinforcement spacer. 5) Perform bar cutting works. 6) Perform bar bending works. 7) Perform reinforcement tying. 8) Perform reinforcement placing. 9) Perform reinforcement spacer placing. 10) Perform housekeeping. 	<ol style="list-style-type: none"> 3) Carry out loading and unloading of material. 4) Carry out concreting work related to waterproofing. 5) Assist in carrying out sample testing. 6) Assist in taking a concrete sample for testing. 7) Carry out concrete mixing. 8) Handle tools and equipment. 9) Perform routine maintenance. 	<ol style="list-style-type: none"> 4) Carry out preparation for testing/inspection. 5) Carry out assembly and installation as per approved construction drawing. 6) Perform routine maintenance. 7) Adhere to safety and security procedure. 8) Follow the standard operating procedure. 9) Update daily work report.
<p style="text-align: center;">LEVEL 1</p>	<p><u>General Workers</u></p> <ol style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist in routine maintenance in accordance with the routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist in controlling the flow of traffic passing near, in or around the worksite. 7) Perform housekeeping. 8) Adhere to safety, health and environmental regulation. 	<p><u>General Workers</u></p> <ol style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist in routine maintenance in accordance with the routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist in controlling the flow of traffic passing near, in or around the worksite. 7) Perform housekeeping. 8) Adhere to safety, health and environmental regulation. 	<p><u>General Workers</u></p> <ol style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist in routine maintenance in accordance with the routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist in controlling the flow of traffic passing near, in or around the worksite. 7) Perform housekeeping. 8) Adhere to safety, health and environmental regulation.

Table 4.23: Group 421 Occupational Competencies (4 of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	Road Drainage System (Brick Work)	Installation (Steelwork)	Cutting / Welding (Steelwork)
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	No Job Title	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution 	No Job Title

		<p>of procedure/work sequence for the project.</p> <ul style="list-style-type: none"> 7) Inspect or review project deliverables to monitor compliance with requirements. 8) Liaise and coordinate with consultant for submission to local authority for approval. 9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction work. 10) Participate in construction management process for smooth progress of construction works. 11) Coordinate constructions work according to Inspection Test Plan. 12) Ensure SHE compliance. <p>Represent company in meetings.</p>	
<p>LEVEL 5</p>	<p><u>Site Engineer</u></p> <ul style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organise construction maintenance activities. 	<p><u>Site Engineer</u></p> <ul style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organise construction maintenance activities. 	<p>No Job Title</p>

	<ul style="list-style-type: none"> 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project. 8) Prepare masterwork program/project milestone. 9) Direct and supervise construction contractor, sub-contractor, or related worker. 10) Identify and report any errors or discrepancies on construction drawings/shop drawings. 11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering. 12) Develop or implement quality control and environmental protection programme. 13) Prepare progress claim for construction work. 14) Prepare variation order. 15) Analyse and verify submission by coordinator. 16) Attend technical and site meetings. 17) Produce as-built drawings. 	<ul style="list-style-type: none"> 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project. 8) Prepare masterwork program/project milestone. 9) Direct and supervise construction contractor, sub-contractor, or related worker. 10) Identify and report any errors or discrepancies on construction drawings/shop drawings. 11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering. 12) Develop or implement quality control and environmental protection programme. 13) Prepare progress claim for construction work. 14) Prepare variation order. 15) Analyse and verify submission by coordinator. 16) Attend technical and site meetings. 17) Produce as-built drawings. 	
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<p>LEVEL 4</p>	<p><u>Road Drainage Senior Supervisor</u></p> <ol style="list-style-type: none"> 1) Act as the primary interface with internal Project Manager and Discipline leads and supervise all Drainage/ Hydrology aspects of major Transportation projects with the clients and contractors on both conventional and design/build projects. 2) A key member of Road/ Highway Practice to assist in executing projects. 3) Responsible for developing the drainage scope and fee and providing staffing for project assignments, both large and small. Projects may include hydrologic analysis, inlet design, storm sewer design, ditch and channel design, cross drain design, retention/detention basin design, and bridge hydraulics. 4) Act as a leader to demonstrate excellent design expertise in these areas, as well as mentor and lead engineers in the preparation of plan documents and reports, such as storm-water plans, drainage criteria documentation, drainage design reports, and hydraulic bridge reports. 	<p><u>Steelwork Senior Supervisor</u></p> <ol style="list-style-type: none"> 1) To coordinate and liaise with Main Contractor and consultant supervisors 2) To plan and supervise construction works to subcontractors and workers 3) To monitor and improvise construction work program to meet work schedule and datelines 4) Able to foresee and resolve construction problems 5) Able to read construction drawings 6) To monitor and control storage of material and equipment at site 7) To prepare and submit progress report for claim purposes 8) To be pro-active and perform other duties as and when required by the job 9) To monitor and minimise defect works 	<p><u>Steelwork Senior Supervisor</u></p> <ol style="list-style-type: none"> 1) To coordinate and liaise with Main Contractor and consultant supervisors 2) To plan and supervise construction works to subcontractors and workers 3) To monitor and improvise construction work program to meet work schedule and datelines 4) Able to foresee and resolve construction problems 5) Able to read construction drawings 6) To monitor and control storage of material and equipment at site 7) To prepare and submit progress report for claim purposes 8) To be pro-active and perform other duties as and when required by the job 9) To monitor and minimise defect works
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	<ol style="list-style-type: none">5) Responsible for overseeing the civil design team's technical deliverables and meeting project schedules from design through construction, as necessary.6) Ensure the highest quality of engineering is put forth to meet all design criteria requirements.7) Reviews work produced to ensure that applicable codes, standards, and procedures are followed and quality is acceptable.8) Supervises the production of project drawings and design calculations.9) Promotes technical excellence on the project, including furthering the Quality Improvement Process.10) Ensures that adequate checking is performed in accordance with discipline checking policy and procedures.11) Ensures that discipline design work is coordinated with project staff and Engineers from other disciplines by maintaining clear and frequent communications.12) Maintains affiliation with professional societies to keep abreast of current technologies.		
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	13) Performs other responsibilities associated with this position as may be appropriate.		
LEVEL 3	<p><u>Road Drainage Supervisor</u></p> <ol style="list-style-type: none"> 1) Monitor construction activities on-site to ensure finished work is in accordance with design, drawings, specifications, and Employer's requirements. 2) Manage the production of as-built records from site works. 3) Ensure that all works are undertaken with regard to CDM regulations and programs. 4) To ensure that the contractors are delivering quality services in compliance with specifications through maintaining adequate site inspection records to address non-compliance issues and resulting remedial actions. 5) To liaise with, where appropriate, other agencies and bodies and internal departments to ensure the site works are coordinated and projects are delivered to the programme. 6) Ensure that comprehensible method statements and risk assessments are available to and understood by those undertaking 	<p><u>Steelwork Supervisor</u></p> <ol style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc.) to determine work requirements. 6) Coordinate work activities. 7) Monitor usage of equipment on construction sites to verify safety and specification compliance. 8) Carry out regular work inspections. 9) Identify and request the requirement materials, manpower and machinery. 10) Attend technical and site meetings. 11) Compile site document or record to prepare report. 12) Raise site safety concerns and identify construction hazards and risks. 	<p><u>Steelwork Supervisor</u></p> <ol style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc.) to determine work requirements. 6) Coordinate work activities. 7) Monitor usage of equipment on construction sites to verify safety and specification compliance. 8) Carry out regular work inspections. 9) Identify and request the requirement materials, manpower and machinery. 10) Attend technical and site meetings. 11) Compile site document or record to prepare report. 12) Raise site safety concerns and identify construction hazards and risks. 13) Report site matters to superior or management. 14) Supervise subordinate work. 15) Supervise compliance of safety, health, and environment requirements. 16) Arrange for maintenance activities.

	<p>works and that the requirements are implemented.</p> <p>7) Ensure that a safe system of work is followed, including the work of other contractors or sub-contractors.</p> <p>8) Ensure all employees and or contractors under your control are competent and adequately trained in health, safety, and environment in the operation of plant and equipment and the processes involved in the workplace.</p> <p>9) Ensure that all operatives receive the relevant daily 'start of shift 'briefings prior to starting work and that regular "toolbox talks" relevant to current/future site activities take place.</p> <p>10) Co-operate with the SHE Manager to achieve the aims of the SHE policies, procedures, and statutory requirements and upon his recommendations.</p>	<p>13) Report site matters to superior or management.</p> <p>14) Supervise subordinate work.</p> <p>15) Supervise compliance of safety, health, and environment requirements.</p> <p>16) Arrange for maintenance activities.</p> <p>17) Perform subordinate appraisal.</p> <p>18) Conduct training for construction methods, operation of machinery and equipment, site safety requirements.</p> <p>19) Troubleshoot and rectify within work scope.</p> <p>20) Prepare and compile reports for site activities, including QA QC documents, SHE documents.</p>	<p>17) Perform subordinate appraisal.</p> <p>18) Conduct training for construction methods, operation of machinery and equipment, site safety requirements.</p> <p>19) Troubleshoot and rectify within work scope.</p> <p>20) Prepare and compile reports for site activities, including QA QC documents, SHE documents.</p>
<p>LEVEL 2</p>	<p><u>Road Drainage Bricklayer</u></p> <p>1) Laying bricks and applying or removing mortar with a trowel</p> <p>2) Working accurately from detailed plans and specifications.</p> <p>3) Sealing foundations with damp-resistant materials</p>	<p><u>Steelwork Installer</u></p> <p>1) Perform work as per construction drawing and method statement.</p> <p>2) Request for material storage area.</p> <p>3) Perform installation of steel structure.</p> <p>4) Carry out welding works.</p>	<p><u>Steelwork Welder</u></p> <p>1) Perform work as per construction drawing and method statement.</p> <p>2) Request for material storage area.</p> <p>3) Determine welding method and material.</p>

	<ul style="list-style-type: none"> 4) Using spirit levels and plumb lines to check building alignment. 5) Using hand tools, power tools and brick-cutting machines 6) Constructing arches and ornamental brickwork 7) Repairing and maintaining building blocks 8) Measuring out build areas and setting out the first rows of bricks and damp course 9) Working outdoors on construction sites, in all weathers and at height. 	<ul style="list-style-type: none"> 5) Carry out hoisting work. 6) Paint the joint part. 7) Carry out support work for steel structure. 8) Adhere to safety and security procedure. 9) Follow Standard Operating Procedure. 	<ul style="list-style-type: none"> 4) Prepare and clean surfaces and special parts for welding purposes. 5) Carry out cutting work. 6) Select, position, and align parts of fixtures to be welded. 7) Carry out welding works. 8) Paint the joint part. 9) Adhere to safety and security procedure. 10) Follow Standard Operating Procedure.
<p>LEVEL 1</p>	<p><u>General Workers</u></p> <ul style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist routine maintenance in accordance with routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist in controlling the flow of traffic passing near, in or around work site. 7) Perform housekeeping. 1) Adhere to safety, health, and environmental regulation. 	<p><u>General Workers</u></p> <ul style="list-style-type: none"> 2) Prepare tools, equipment, and machinery. 3) Prepare materials. 4) Assist site works according to instruction. 5) Assist routine maintenance in accordance with routine schedule. 6) Assist in materials loading and unloading activities. 7) Assist to control the flow of traffic passing near, in or around work site. 8) Perform housekeeping. 1) Adhere to safety, health and environment regulation. 	<p><u>General Workers</u></p> <ul style="list-style-type: none"> 2) Prepare tools, equipment, and machinery. 3) Prepare materials. 4) Assist site works according to instruction. 5) Assist in routine maintenance in accordance with routine schedule. 6) Assist in materials loading and unloading activities. 7) Assist to control the flow of traffic passing near, in or around work site. 8) Perform housekeeping. 1) Adhere to safety, health and environment regulation.

Table 4.24: Group 421 Occupational Competencies (5 of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	Retaining Wall	Slope Protection	Grouting
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	No Job Title	No Job Title	No Job Title
LEVEL 5	<p><u>Site Engineer</u></p> <ol style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organise construction maintenance activities. 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project. 	<p><u>Site Engineer</u></p> <ol style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organise construction maintenance activities. 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project. 	No Job Title

	<ul style="list-style-type: none"> 8) Prepare masterwork program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor, or related worker. 10) Identify and report any errors or discrepancies on construction drawings/shop drawings. 11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering. 12) Develop or implement quality control and environmental protection programme. 13) Prepare progress claim for construction work. 14) Prepare variation order. 15) Analyse and verify submission by coordinator. 16) Attend technical and site meetings. 17) Produce as-built drawings. 	<ul style="list-style-type: none"> 8) Prepare masterwork program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor, or related worker. 10) Identify and report any errors or discrepancies on construction drawings/shop drawings. 11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering. 12) Develop or implement quality control and environmental protection programme. 13) Prepare progress claim for construction work. 14) Prepare variation order. 15) Analyse and verify submission by coordinator. 16) Attend technical and site meetings. 18) Produce as-built drawings. 	
<p>LEVEL 4</p>	<p><u>Retaining Wall Senior Supervisor</u></p> <ul style="list-style-type: none"> 1) Inspecting construction sites regularly to identify and eliminate potential safety hazards. 2) Supervising and instructing the construction team as well as subcontractors. 	<p><u>Slope Protection Senior Supervisor</u></p> <ul style="list-style-type: none"> 1) Inspecting construction sites regularly to identify and eliminate potential safety hazards. 2) Supervising and instructing the construction team as well as subcontractors. 	<p>No Job Title</p>

	<ul style="list-style-type: none"> 3) Educating site workers on construction safety regulations and accident protocol. 4) Enforcing site safety rules to minimise work-related accidents and injuries. 5) Handling site accidents in accordance with established accident protocol. 6) Maintaining an accurate record of construction employee attendance. 7) Evaluating the performance of construction employees and instituting disciplinary measures as needed. 8) Analysing blueprints to ensure that construction projects meet design, safety, and budget specifications. 9) Recommending changes to construction operations or procedures to increase efficiency. 	<ul style="list-style-type: none"> 3) Educating site workers on construction safety regulations and accident protocol. 4) Enforcing site safety rules to minimise work-related accidents and injuries. 5) Handling site accidents in accordance with established accident protocol. 6) Maintaining an accurate record of construction employee attendance. 7) Evaluating the performance of construction employees and instituting disciplinary measures as needed. 8) Analysing blueprints to ensure that construction projects meet design, safety, and budget specifications. 9) Recommending changes to construction operations or procedures to increase efficiency. 	
<p>LEVEL 3</p>	<p><u>Retaining Wall Supervisor</u></p> <ul style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 	<p><u>Slope Protection Supervisor</u></p> <ul style="list-style-type: none"> 1) Sets up, manages, and removes temporary traffic control schemes/signs 2) Directs vehicular and pedestrian traffic around construction zones, accidents or other road disruptions, ensuring the safety of 	<p><u>Grouting Supervisor</u></p> <ul style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan,

	<p>5) Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc.) to determine work requirements.</p> <p>6) Coordinate work activities.</p> <p>7) Monitor usage of equipment on construction sites to verify safety and specification compliance.</p> <p>8) Carry out regular work inspections.</p> <p>9) Identify and request the requirement materials, manpower and machinery.</p> <p>10) Attend technical and site meetings.</p> <p>11) Compile site document or record to prepare report.</p> <p>12) Raise site safety concerns and identify construction hazards and risks.</p> <p>13) Report site matters to superior or management.</p> <p>14) Supervise subordinate work.</p> <p>15) Supervise compliance of safety, health, and environment requirements.</p> <p>16) Arrange for maintenance activities.</p> <p>17) Perform subordinate appraisal.</p> <p>18) Conduct training for construction methods, operation of machinery</p>	<p>emergency response teams, construction workers and the general public.</p> <p>3) Handles a Stop-Slow sign, or manages other similar traffic control signs and devices, to direct traffic.</p> <p>4) Communicates with other road traffic personnel, construction workers and emergency response teams via radio to provide and receive updates on traffic conditions.</p> <p>5) Completes site checks and monitors traffic behaviour and/or flow to ensure safety is always maintained.</p> <p>6) Takes instructions from crew leaders, foremen, managers, inspectors, auditors, or officials.</p>	<p>method statement, construction drawing, etc.) to determine work requirements.</p> <p>6) Coordinate work activities.</p> <p>7) Monitor usage of equipment on construction sites to verify safety and specification compliance.</p> <p>8) Carry out regular work inspections.</p> <p>9) Identify and request the requirement materials, manpower and machinery.</p> <p>10) Attend technical and site meetings.</p> <p>11) Compile site document or record to prepare report.</p> <p>12) Raise site safety concerns and identify construction hazards and risks.</p> <p>13) Report site matters to superior or management.</p> <p>14) Supervise subordinate work.</p> <p>15) Supervise compliance of safety, health, and environment requirements.</p> <p>16) Arrange for maintenance activities.</p> <p>17) Perform subordinate appraisal.</p> <p>18) Conduct training for construction methods, operation of machinery and equipment, site safety requirements.</p> <p>19) Troubleshoot and rectify within work scope.</p> <p>20) Prepare and compile reports for site activities, including QA QC documents, SHE documents.</p>
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	<p>and equipment, site safety requirements.</p> <p>19) Troubleshoot and rectify within work scope.</p> <p>20) Prepare and compile reports for site activities, including QA QC documents, SHE documents.</p>		
<p>LEVEL 2</p>	<p><u>Retaining Wall Machine Operator</u></p> <ol style="list-style-type: none"> 1) Operate tools, equipment, and machinery. 2) Carry out construction works according to instruction and drawing. 3) Carry out routine maintenance in accordance with routine schedule. 4) Perform loading and unloading activities of materials. 5) Perform housekeeping. 7) Adhere to safety, health, and environment regulation. 	<p><u>Slope Protection Machine Operator</u></p> <ol style="list-style-type: none"> 1) Operate tools, equipment, and machinery. 2) Carry out construction works according to instruction and drawing. 3) Carry out routine maintenance in accordance with routine schedule. 4) Perform loading and unloading activities of materials. 5) Perform housekeeping. 6) Adhere to safety, health, and environment regulation. 	<p><u>Grouting Foreman</u></p> <ol style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc.) to determine work requirements. 6) Coordinate work activities. 7) Monitor usage of equipment on construction sites to verify safety and specification compliance. 8) Carry out regular work inspections. 9) Identify and request the requirement materials, manpower and machinery. 10) Attend technical and site meetings. 11) Compile site document or record to prepare report. 12) Raise site safety concerns and identify construction hazards and risks.

			<p>13) Report site matters to superior or management.</p> <p>14) Supervise subordinate work.</p> <p>15) Supervise compliance of safety, health, and environment requirements.</p> <p>16) Arrange for maintenance activities.</p> <p>17) Perform subordinate appraisal.</p>
LEVEL 1	<p><u>General Workers</u></p> <p>1) Prepare tools, equipment, and machinery.</p> <p>2) Prepare materials.</p> <p>3) Assist site works according to instruction.</p> <p>4) Assist routine maintenance in accordance with routine schedule.</p> <p>5) Assist in materials loading and unloading activities.</p> <p>6) Assist to control the flow of traffic passing near, in or around work site.</p> <p>7) Perform housekeeping.</p> <p>8) Adhere to safety, health and environment regulation.</p>	<p><u>General Workers</u></p> <p>1) Prepare tools, equipment, and machinery.</p> <p>2) Prepare materials.</p> <p>3) Assist site works according to instruction.</p> <p>4) Assist routine maintenance in accordance with routine schedule.</p> <p>5) Assist in materials loading and unloading activities.</p> <p>6) Assist to control the flow of traffic passing near, in or around work site.</p> <p>7) Perform housekeeping.</p> <p>8) Adhere to safety, health and environment regulation.</p>	<p><u>Grouter</u></p> <p>1) Prepare tools, equipment, and machinery.</p> <p>2) Prepare materials.</p> <p>3) Assist site works according to instruction.</p> <p>4) Assist routine maintenance in accordance with routine schedule.</p> <p>5) Assist in materials loading and unloading activities.</p> <p>6) Assist to control the flow of traffic passing near, in or around work site.</p> <p>7) Perform housekeeping.</p> <p>8) Adhere to safety, health and environment regulation.</p> <p>9) Operate hand and power tools</p> <p>10) Clean and prepare sites, dig trenches, set braces to support the sides of excavations, clean up rubble, debris, and other waste materials.</p>

Table 4.25: Group 421 Occupational Competencies (6 of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	Tunnel Lining (Segment)	Tunnel Lining (Crane)	Tunnel Boring
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution 	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of 	<p><u>Tunnel Manager</u></p> <ol style="list-style-type: none"> 1) Responsible for overall maintenance and operation of Plant and Equipment for Tunnelling, including TBM 2) Fully responsible for the management of TBM, tunnelling work and analysis of tunnelling work progress and timely progress reporting. 3) Managing and operating the EPB TBM's, planning logistics and managing the Plant team. 4) Oversee compressed air works for Cutterhead Intervention 5) Oversee mechanical activities, maintenance, testing and commissioning of TBM & plant equipment/machinery. 6) Review TBM design and plan Tunnel Equipment Compatible to TBM.

	<p>of procedure/work sequence for the project.</p> <ol style="list-style-type: none"> 7) Inspect or review project deliverables to monitor compliance with requirements. 8) Liaise and coordinate with consultant for submission to local authority for approval. 9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction work. 10) Participate in construction management process for smooth progress of construction works. 11) Coordinate constructions work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings. 	<p>procedure/work sequence for the project.</p> <ol style="list-style-type: none"> 7) Inspect or review project deliverables to monitor compliance with requirements. 8) Liaise and coordinate with consultant for submission to local authority for approval. 9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction work. 10) Participate in construction management process for smooth progress of construction works. 11) Coordinate constructions work according to Inspection Test Plan. 12) Ensure SHE compliance. 14) Represent company in meetings. 	<ol style="list-style-type: none"> 7) Responsible for TBM assembly and dismantling operations and coordinate between TBM manufacturer and contractors to ensure works are carried in compliance with Project Safety Plan 8) Manage and lead a team [TBM] to ensure maintenance of TBM, Plant and Equipment for timely submission of maintenance records to Tunnel Manager. 9) Evaluate and review TBM and other plant downtime and breakdowns to minimise delay to Tunneling operations.
<p>LEVEL 5</p>	<p><u>Segment Engineer</u></p> <ol style="list-style-type: none"> 1) Prepare method statements, safe work procedures, risk register, daily/weekly reports, tunnel progress reports, and other tunnel related documentation. 2) Maintain and monitor quality control and records 3) Prepare and carry out presentation of tunnelling works prior to commencement of works. 	<p><u>Segment Engineer</u></p> <ol style="list-style-type: none"> 1) Lead the development of the ground control centre with the segment team 2) As a product owner or technical manager, assist the supplier’s development team. 3) Perform system design work, including requirement review, definition, tailoring, analysis, and conversion to use cases and user stories 	<p><u>Shift Boss</u></p> <ol style="list-style-type: none"> 1) Planning, scheduling, coordinating, inspecting, assigning, and supervising the work of the crew engaged in tunnel construction. 2) Managing the overall tunnelling works, including TBM operation and the production of tunnel development 3) Coordinating all aspects of the tunnel construction to ensure they are carried out to meet the requirements of programme, budget, contractual

	<ul style="list-style-type: none"> 4) Conduct daily site inspection and supervision of ground improvement, ERSS, deep excavation and bored tunnelling works 5) Supervision work on a TBM machine controlling the tunnel labour in excavation and ring build 6) Maintain site records of excavated volumes, grouting records, and other construction work 7) Plan and monitor and track site progress, manpower mobilisation and equipment deployment 8) Ensure job safety analysis and site safety compliance 9) Coordinate various subcontractors to ensure work runs smoothly 10) Identify and assess any foreseeable risk arising from the workplace or work processes, minimise environmental impact associated with the construction activities 11) Ensure safe work procedures and environmental control measures are implemented at the worksite. 	<ul style="list-style-type: none"> 4) Interface definition between segments and subsystems 5) Development support, test planning, preparation and implementation 6) Act as a point of contact with the supplier's technical team for the segment. 7) Integration and configuration management of subsystem software at the ground control centre. 8) Conduct or support segment validation, validation, and integration. 9) Participate in control system testing and/or simulation work. 10) Provide support for defining operational concepts. 11) Documents and supports ground segments. 12) Assist the operations team in solving technical problems and provide practical advice. 	<p>standards, safety standards, and government regulations</p> <ul style="list-style-type: none"> 4) Actively training and developing the skillset of the Shift Bosses and Assistant Shift Bosses. 5) Setting development targets for your junior staff and reporting/demonstrating their development progress. 6) Ensuring the proper operating condition of the TBM and the availability of adequate construction materials, equipment, and tools in the tunnel 7) Monitoring the productivity of the tunnel works to maximise progress and project achievement. 8) Identifying problem areas and investigating corrective actions 9) Reporting any problems immediately to the Tunnel Manager and reporting on a regular basis on the progress of tunnelling activities
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	12) Liaise with authorities, consultants, and subcontractors.		
LEVEL 4	<p><u>Senior Material Coordinator</u></p> <ol style="list-style-type: none"> 1) Maintains inventory levels of supplies and uses handheld devices to inventory. Analyse and adjust levels according to product usage trends. Rotates stock, cleans cart and straightens up products to assure a neat and orderly cart appearance. 2) Coordinates/Delivers products and/or equipment to requesting location following proper delivery techniques and safety guidelines (cart covers applied when needed, proper stacking and load securing) 3) Coordinates/Picks products from storeroom inventory according to requisitions/pick lists. Maintain correct inventory counts and financial reporting to the users through weekly cycle counts/reporting and yearly physical inventories. 4) Coordinates/Unpacks and check delivery against purchase order. Follow-up with the Purchasing department orders without a purchase order. Report any 	<p><u>Senior Plant Coordinator</u></p> <ol style="list-style-type: none"> 1) Independent quote development of Contractor BOMs. Primary contact for smaller plant purchase orders. Lead role player on complex multi-faceted programs with multiple contracts and customers. 2) Provides material pricing for customers and/or estimators to include product application, plan/specification interpretation, and obtaining timely and accurate replacement costs from department/branch approved vendors. 3) Obtains required information for customers to accurately create and enter Job Information Sheets. 4) Coordinates with sales and credit department. 5) Prepares material product submittals. Coordinates with estimator, sales, vendors, and customer to complete high quality, accurate documents of the materials we are supplying, which complies with the plans and specifications. 	<p><u>Tunnel shift engineer</u></p> <ol style="list-style-type: none"> 1) Responsible for ensuring that site operations within the areas of its competence are performed in compliance with approved working procedures and quality requirements. 2) Provides technical support and assistance to the Site Superintendent in coordinating routine and special activities and acts as a link between the field and the technical office. 3) Assistance to the supervision of excavation, support of excavation and other activities. 4) Survey control. 5) Tracking material consumption, quantity reports. 6) Follow and protect geotechnical instrumentation. 7) Interface with the Quality control department. 8) Daily Reports 9) Preparation of work plans, lift plans and Job Hazard Analysis. 10) Reporting to superiors and ensuring an effective exchange of information at all levels 11) Rebar and formwork take off and previous inspection placement

	<p>damaged boxes/products or discrepancies. Input purchase order and delivery ticket information into computer to maintain accurate records of material/supplies received and schedules for delivery.</p> <p>5) Coordinate/Clean and maintain general working area, equipment, par carts. Check for expired products on par carts and in storeroom.</p> <p>6) Coordinate/Ensure that required documentation for activities within areas of responsibility is performed in an accurate and timely manner.</p> <p>7) Facilitates communication between Health system personnel and team members to ensure continuity and coordination of services.</p>	<p>6) Prepares operation and maintenance manuals as required for items on the project. Coordinates with estimator, sales, vendors, and customer.</p> <p>7) Prepares sales orders from the material releases as provided by sales or customer. Ensures materials sold are in compliance with approved material product submittal and profit margins established by Sales and/or Branch Management are maintained. Provides order acknowledgement to sales and customers. Establishes delivery dates, monitors, and communicates changes.</p> <p>8) Creates purchase orders and coordinates with branch purchasing to obtain required materials in the allotted time frame. Obtains order confirmations and resolves discrepancies, and reports changes to sales. Monitors material shipping dates and communicate any schedule deviations to sales and the customer. Coordinates with operations receiving department to ensure material is correct.</p>	<p>12) Preparation of 3 weeks look ahead schedule for the site in coordination with the Superintendent</p>
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<p>LEVEL 3</p>	<p><u>Supervisor</u></p> <ol style="list-style-type: none"> 1) Monitor construction activities on-site to ensure finished work is in accordance with design, drawings, specifications, and Employer's requirements. 2) Manage the production of as-built records from site works. 3) Ensure that all works are undertaken with regard to CDM regulations and programs. 4) To ensure that the contractors are delivering quality services in compliance with specifications through maintaining adequate site inspection records to address non-compliance issues and resulting remedial actions. 5) To liaise with, where appropriate, other agencies and 	<p><u>Plant Coordinator</u></p> <ol style="list-style-type: none"> 1) Coordinates the development of scorecards and metrics for the high-performance team process. Review and recommend changes as necessary to meet plant objectives 2) Prepares and shares with management monthly high-performance team results and recommendations 3) Installs and leads the high-performance team steering committee, documents high-performance team plans 4) Ensures certification process for high-performance teams, star points, star guides, and cross-functional training are effective. 	<p><u>TBM Operator</u></p> <ol style="list-style-type: none"> 1) Operate theodolite 2) Install tunnel segments 3) Tend boring machine 4) Use safety equipment in construction 5) Drive tunnel boring machine 6) Transport construction supplies 7) Follow health and safety procedures in construction 8) React to events in time-critical environments 9) Work ergonomically 10) Prevent damage to utility infrastructure 11) Switch tunnel boring machine modes

	<p>bodies and internal departments to ensure the site works are coordinated and projects are delivered to the programme.</p> <p>6) Ensure that comprehensible method statements and risk assessments are available to and understood by those undertaking works and that the requirements are implemented.</p> <p>7) Ensure those safe systems of work are followed, including the work of other contractors or sub-contractors.</p> <p>8) Ensure all employees and or contractors under your control are competent and adequately trained in health, safety, and environment in the operation of plant and equipment and the processes involved in the workplace.</p> <p>9) Ensure that all operatives receive the relevant daily 'start of shift 'briefings prior to starting work and that regular "toolbox talks" relevant to current/future site activities take place.</p> <p>10) Co-operate with the SHE Manager to achieve the aims of the SHE policies, procedures,</p>	<p>5) Identifies the top-performing teams on a monthly and annual basis. Coordinates recognition of teams</p> <p>6) Ensures the high-performance team concepts are understood and used at all levels of the plant</p> <p>7) Ensures support information is accurate and timely</p>	
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	and statutory requirements and upon his recommendations.		
LEVEL 2	<p><u>Tunnel Technician</u></p> <ol style="list-style-type: none"> 1) Administer all work yard operations and ensure compliance with safety policies. 2) Always maintain a neat and clean yard. 3) Develop and implement yard fire protection programs to ensure fire safety. 4) Maintain optimal level of customer services and assist in resolving all customer issues. 5) Supervise all customer and company staff in all yard operations. 6) Hire and train staff to develop and achieve all work objectives and evaluate performance on a regular basis. 7) Perform appraisals for staff, evaluate work and recommend changes as required. 8) Perform surveys and analyse results to implement all safe work procedures. 9) Coordinate with supervisor and receive all materials and prepare necessary paperwork for same. 	<p><u>Hoisting Supervisor***</u></p> <ol style="list-style-type: none"> 1) Working as part of a team to ensure lifting operations comply with the law and secure the health and safety of employees and of all those affected by the operations 2) Coordinating and supervising all lifting activities in accordance with the Lifting Plan 3) Briefing all lifting team members 4) Being present during all lifting operations 5) Ensuring that ground conditions are safe for any operations involving mobile cranes 6) Taking suitable measures to rectify unsafe conditions 7) Ensuring only registered operators and appointed staff are involved in any lifting operation 8) In a full-time position, Crane Supervisors usually work between 35 and 40 hours per week 9) Working hours can be variable, and overtime may be required in order to meet project deadlines 	<p><u>TBM Mechanic**</u></p> <ol style="list-style-type: none"> 1) Inspect, troubleshoot and fix running equipment as necessary 2) Identify operating problems mechanical operating problems and perform emergency repairs. 3) Perform routine maintenance work on TBM equipment. 4) Responsible for the installation of TBM parts, including repair and replacing damaged/worn out parts 5) Testing of TBM equipment to ensure smooth running. 6) Assist the daily activities at the worksite to meet project progress.

	<ul style="list-style-type: none"> 10) Ensure proper handling of all materials and store them appropriately. 11) Monitor inventory of yard supplies and place purchase orders as necessary. 12) Perform routine and non-routine maintenance on equipment and prepare reports to submit to store manager. 13) Monitor loading of materials to ensure safe transfer to other stores. 14) Coordinate with other departments and investigate accidents and identify root cause of damage. 15) Monitor work of employees and initiate disciplinary actions as required. 		
<p style="text-align: center;">LEVEL 1</p>	<p><u>Assistant Tunnel Technician</u></p> <ul style="list-style-type: none"> 1) Using computers with construction management software to help keep the work running smoothly 2) Preparing the site for tunnelling work 3) Organising the delivery and storage of all the equipment 4) Ensuring the correct materials are available to start work 	<p><u>Tunnel Crew</u></p> <ul style="list-style-type: none"> 1) Using computers with construction management software to help keep the work running smoothly 2) Preparing the site for tunnelling work 3) Organising the delivery and storage of all the equipment 4) Ensuring the correct materials are available to start work 	<p><u>Tunnel Crew</u></p> <ul style="list-style-type: none"> 1) Using computers with construction management software to help keep the work running smoothly 2) Preparing the site for tunnelling work 3) Organising the delivery and storage of all the equipment 4) Ensuring the correct materials are available to start work 5) Moving and handling materials, resources, and components by

	<p>5) Moving and handling materials, resources, and components by mechanically assisted or manual means.</p> <p>6) Loading and unloading, handling, and conveying goods and materials.</p>	<p>5) Moving and handling materials, resources, and components by mechanically assisted or manual means</p> <p>6) Loading and unloading, handling, and conveying goods and materials.</p>	<p>mechanically assisted or manual means</p> <p>6) Loading and unloading, handling, and conveying goods and materials.</p>
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Table 4.26: Group 421 Occupational Competencies (7 of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	Tunnel Plant & Workshop	Tunnel Safety	Beam Launching
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	<p><u>Plant Manager</u></p> <p>1) Managing the overall delivery of the project program in accordance with the client agreed on date/specifications and budget.</p> <p>2) Managing sub-contractors, consultants, and other strategic relationships to source for effective cost and effective delivery</p>	<p><u>Construction Manager</u></p> <p>1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines.</p> <p>2) Review project costing and request budget estimates.</p> <p>3) Review and ensure construction layout design in terms of functionality, buildability,</p>	No Job Title

	<ul style="list-style-type: none"> 3) Assigning resources to deliver works within budget, time, quality, and regulatory standards 4) Monitoring and guiding workflow, setting daily, weekly, and 90 days and yearly project goals. The ability to deliver weekly and monthly targets/ delivery is crucial in being successful. 5) Reviewing progress against plans, contractual arrangements, and delivery milestones and being able to problem-solve and propose solutions is crucial in being successful. 6) Financial management includes ensuring strong contract, commercial and financial risk management, accurate forecasting on costs with delivery and margin management while taking corrective actions as required. 13) Managing site team to keep track of work schedule by ISO requirement. 	<ul style="list-style-type: none"> maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of procedure/work sequence for the project. 7) Inspect or review project deliverables to monitor compliance with requirements. 8) Liaise and coordinate with consultant for submission to local authority for approval. 9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction work. 10) Participate in construction management process for smooth progress of construction works. 11) Coordinate constructions work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings. 	
<p>LEVEL 5</p>	<p><u>Plant Engineer</u></p>	<p><u>Tunnel Engineer</u></p>	<p><u>Site Engineer</u> 1) Plan, schedule, or coordinate site activities to meet deadlines.</p>

	<ol style="list-style-type: none"> 1) Designing and implementing equipment modifications to help improve safety and reliability 2) Investigating and testing ideas to improve existing systems or to overcome machinery problems 3) Making parts and installing and testing machinery 4) Carrying out maintenance and identifying and repairing faults in equipment 5) Solving complex problems with manufacturing departments, sub-contractors, suppliers, and customers 6) Managing projects 7) Planning and designing new production processes 8) Working with other professionals, within and outside the engineering sector 13) Monitoring and commissioning plant and systems. 	<ol style="list-style-type: none"> 1) Meeting with the engineering team to discuss the scope and scale of the project. 2) Creating rough draft designs and listing possible engineering tasks. 3) Finalising the tunnel design and managing all engineering tasks. 4) Assisting with the drafting of IDRIS Preliminary Design Reports. 5) Obtaining the necessary permits and approvals for the project. 6) Developing tender documents for the project. 7) Assisting with the qualification of potential contractors. 8) Providing contractors with technical drawings and engineering documents. 9) Conducting on-site safety and progress inspections. 10) Providing program support and resolving construction issues. 	<ol style="list-style-type: none"> 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organise construction maintenance activities. 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project. 8) Prepare masterwork program/project milestone. 9) Direct and supervise construction contractor, sub-contractor, or related worker. 10) Identify and report any errors or discrepancies on construction drawings/shop drawings. 11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering. 12) Develop or implement quality control and environmental protection programme. 13) Prepare progress claim for construction work.
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			14) Prepare variation order. 15) Analyse and verify submission by coordinator. 16) Attend technical and site meetings. 17) Produce as-built drawings.
LEVEL 4	<p><u>Senior Mechanic Foreman</u></p> <ol style="list-style-type: none"> 1) Conduct regular maintenance on machinery, systems, and automotive vehicles. 2) Meet with clients to better understand their concerns and identify the issue. 3) Assemble mechanical components according to specifications. 4) Examine machines and oversee diagnostic tests to determine functionality problems. 5) Design a plan of action for all maintenance tasks and upgrades. 6) Maintain work logs, repairs, and maintenance records. 	<p><u>Shift Boss</u></p> <ol style="list-style-type: none"> 1) Planning, scheduling, coordinating, inspecting, assigning, and supervising the work of the crew engaged in tunnel construction. 2) Managing the overall tunnelling works, including TBM operation and the production of tunnel development 3) Coordinating all aspects of the tunnel construction to ensure they are carried out to meet the requirements of programme, budget, contractual standards, safety standards, and government regulations 4) Actively training and developing the skillset of the Shift Bosses and Assistant Shift Bosses. 5) Setting development targets for your junior staff and reporting/demonstrating their development progress. 6) Ensuring the proper operating condition of the TBM and the availability of adequate construction 	<p><u>Beam Launcher Senior Supervisor</u></p> <ol style="list-style-type: none"> 1) Reporting to the Construction Manager. 2) Day-to-day management of the site, including supervising and monitoring the site labour force and the beam launching works of any subcontractors to ensure within time and quality. 3) Planning the beam launching work and efficiently organising the plant and site facilities to meet agreed on deadlines. 4) Liaise with consultants on all site matters, e.g., timely issuance of construction drawings, follow up on drawings, amendments, etc. 5) Observe and ensure all equipment and procedures comply with safety regulations. 6) Coordinates with sub-contractors on details, sequence, and programme of works. 7) Ensuring that all materials used are within budgeted quantity and work performed are as per specifications.

		<p>materials, equipment, and tools in the tunnel</p> <ol style="list-style-type: none"> 7) Monitoring the productivity of the tunnel works to maximise progress and project achievement. 8) Identifying problem areas and investigating corrective actions 9) Reporting any problems immediately to the Tunnel Manager and reporting on a regular basis on the progress of tunnelling activities 	<ol style="list-style-type: none"> 8) Measurement and valuation in collaboration with Contracts Department where appropriate, providing data in respect of variation orders and site instructions.
<p>LEVEL 3</p>	<p><u>Mechanic Foreman</u></p> <ol style="list-style-type: none"> 1) Observing, receiving, and otherwise obtaining information from all relevant sources. 2) Inspecting equipment, structures, or materials to identify the cause of errors or other problems or defects. 3) Analysing information and evaluating results to choose the best solution and solve problems. 4) Identifying the underlying principles, reasons, or facts of information by breaking down information or data into separate parts. 5) Servicing, repairing, adjusting, and testing machines, devices, moving parts, and equipment that operate primarily on the basis of mechanical (not electronic) principles. 	<p><u>ERT Foreman</u></p> <ol style="list-style-type: none"> 1) Maintain progress and safety during works 2) Assist tunnel engineer in ensuring temporary works installation is carried out properly and safety 3) Ensure ring installed is carried out in accordance with planned sequence and safe manner. 4) Assist and support engineers in carrying out works as assigned and ensuring that the works are carried out to schedule and in accordance with relevant regulations 5) Coordinate and supervise site workers 6) Ensure completion of work in accordance with the main contractor program and requirements 	<p><u>Beam Launcher Supervisor</u></p> <ol style="list-style-type: none"> 1) Liaise with managers 2) Check compatibility of materials 3) Ensure compliance with construction project deadline 4) Coordinate construction activities 5) Inspect construction supplies 6) Supervise staff 7) Identify defects in concrete 8) Evaluate employee's work 9) Identify external risks to bridge integrity 10) Follow health and safety procedures in construction 11) Work in construction team 12) Plan resource allocation 13) Plan shifts of employees 14) Use safety equipment in construction 15) Conduct quality control analysis

	<p>6) Developing specific goals and plans to prioritise, organise, and accomplish your work.</p> <p>7) Performing physical activities that require considerable use of your arms and legs and moving your whole body, such as climbing, lifting, balancing, walking, stooping, and handling of materials.</p> <p>8) Keeping up-to-date technically and applying new knowledge to your job.</p> <p>9) Assessing the value, importance, or quality of things or people.</p> <p>10) Identifying the educational needs of others, developing formal educational or training programs or classes, and teaching or instructing others.</p> <p>11) Getting members of a group to work together to accomplish tasks.</p> <p>12) Communicating with people outside the organisation, representing the organisation to customers, the public, government, and other external sources.</p> <p>13) This information can be exchanged in person, in writing, or by telephone or e-mail. Using computers and computer systems to set up functions, enter data, process</p>	<p>7) Preparation and submission of site daily reports/progress</p>	<p>16) React events in time-critical environments</p> <p>17) Manage health and safety standards</p> <p>18) Interpret 3D plans</p> <p>19) Monitor stock level</p> <p>20) Process incoming construction supplies</p> <p>21) Interpret 2D plans</p> <p>22) Secure working area</p> <p>23) Prevent damage to utility infrastructure</p>
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	<p>timesheets and/or process information.</p> <p>14) Providing information to supervisors, co-workers, and subordinates by telephone, in written form, e-mail, or in person.</p>		
<p>LEVEL 2</p>	<p><u>Surface & Workshop Mechanic</u></p> <ol style="list-style-type: none"> 1) Inspecting machines for defects, often using specialist computer equipment 2) Undertaking routine inspections of engines, gearboxes, hydraulics, electrical systems, tyres, and frames 3) Dismantling and repairing or replacing faulty components of tunnel 4) Reassembling and testing components to ensure they're working safely 5) Checking new equipment before it's used on site 6) Using reports to diagnose and find faults 7) Keeping records of work done to machinery 8) Explaining faults to colleagues and managers 9) Using a wide range of specialist hand and power tools, including sockets, spanners, screwdrivers, 	<p><u>ERT Crew*</u></p> <ol style="list-style-type: none"> 1) Activate the Emergency Response team 2) Activate additional response contractors and local resources 3) Evaluate the Severity, Potential Impact, Safety Concerns, and Response Requirements based on the initial information provided by the First Person On-Scene 4) Confirm safety aspects at site, including need for personal protective equipment, sources of ignition, and potential need for evacuation 5) Communicate and provide incident briefings to company superiors, as appropriate 6) Coordinate/complete additional internal and external notifications 7) Communicate with Emergency Response Team, as the situation demands 8) Direct response and clean-up operations 	<p><u>Beam Launcher Operator</u></p> <ol style="list-style-type: none"> 1) Operate tools, equipment, and machinery. 2) Carry out construction works according to instruction and drawing. 3) Carry out routine maintenance in accordance with routine schedule. 4) Perform loading and unloading activities of materials. 5) Perform housekeeping. 6) Adhere to safety, health, and environment regulation.

	drills, lifting gear, and welding and cutting equipment		
LEVEL 1	<p><u>Tunnel Crew</u></p> <ol style="list-style-type: none"> 1) Using computers with construction management software to help keep the work running smoothly 2) Preparing the site for tunnelling work 3) Organising the delivery and storage of all the equipment 4) Ensuring the correct materials are available to start work 5) Moving and handling materials, resources, and components by mechanically assisted or manual means 6) Loading and unloading, handling, and conveying goods and materials. 	<p><u>Tunnel Crew</u></p> <ol style="list-style-type: none"> 1) Using computers with construction management software to help keep the work running smoothly 2) Preparing the site for tunnelling work 3) Organising the delivery and storage of all the equipment 4) Ensuring the correct materials are available to start work 5) Moving and handling materials, resources, and components by mechanically assisted or manual means 6) Loading and unloading, handling, and conveying goods and materials. 	<p><u>General Workers</u></p> <ol style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist in routine maintenance in accordance with routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist to control the flow of traffic passing near, in or around work site. 7) Perform housekeeping. 8) Adhere to safety, health and environment regulation.

Table 4.27: Group 421 Occupational Competencies (8 of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	Bridge Structure (Prestressed)	Bridge Structure (Concrete Work)	Bridge Structure (Reinforcement Work)
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of 	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of 	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of

	<p>procedure/work sequence for the project.</p> <ol style="list-style-type: none"> 7) Inspect or review project deliverables to monitor compliance with requirements. 8) Liaise and coordinate with consultant for submission to local authority for approval. 9) Liaise with client, consultant, supplier, contractor, sub-contractor and all relevant parties for all construction works. 10) Participate in construction management process for smooth progress of construction works. 11) Coordinate constructions work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings. 	<p>procedure/work sequence for the project.</p> <ol style="list-style-type: none"> 7) Inspect or review project deliverables to monitor compliance with requirements. 8) Liaise and coordinate with consultant for submission to local authority for approval. 9) Liaise with client, consultant, supplier, contractor, sub-contractor and all relevant parties for all construction works. 10) Participate in construction management process for smooth progress of construction works. 11) Coordinate constructions work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings. 	<p>procedure/work sequence for the project.</p> <ol style="list-style-type: none"> 7) Inspect or review project deliverables to monitor compliance with requirements. 8) Liaise and coordinate with consultant for submission to local authority for approval. 9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction work. 10) Participate in construction management process for smooth progress of construction works. 11) Coordinate constructions work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings.
LEVEL 5	<p><u>Site Engineer</u></p> <ol style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organise construction maintenance activities. 	<p><u>Site Engineer</u></p> <ol style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organise construction maintenance activities. 	<p><u>Site Engineer</u></p> <ol style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organise construction maintenance activities.

	<ul style="list-style-type: none"> 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project. 8) Prepare masterwork program/project milestone. 9) Direct and supervise construction contractor, sub-contractor, or related worker. 10) Identify and report any errors or discrepancies on construction drawings/shop drawings. 11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering. 12) Develop or implement quality control and environmental protection programme. 13) Prepare progress claim for construction work. 14) Prepare variation order. 15) Analyse and verify submission by coordinator. 16) Attend technical and site meetings. 17) Produce as-built drawings. 	<ul style="list-style-type: none"> 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project. 8) Prepare masterwork program/project milestone. 9) Direct and supervise construction contractor, sub-contractor, or related worker. 10) Identify and report any errors or discrepancies on construction drawings/shop drawings. 11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering. 12) Develop or implement quality control and environmental protection programme. 13) Prepare progress claim for construction work. 14) Prepare variation order. 15) Analyse and verify submission by coordinator. 16) Attend technical and site meetings. 17) Produce as-built drawings. 	<ul style="list-style-type: none"> 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project. 8) Prepare masterwork program/project milestone. 9) Direct and supervise construction contractor, sub-contractor, or related worker. 10) Identify and report any errors or discrepancies on construction drawings/shop drawings. 11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering. 12) Develop or implement quality control and environmental protection programme. 13) Prepare progress claim for construction work. 14) Prepare variation order. 15) Analyse and verify submission by coordinator. 16) Attend technical and site meetings. 17) Produce as-built drawings.
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<p>LEVEL 4</p>	<p><u>Pre & Post Tensioned Senior Supervisor</u></p> <ol style="list-style-type: none"> 1) Supervises and coordinates activities of workers engaged in assembly of pre-cut wood and metal forms for moulding reinforced concrete slabs and beams, and pouring and finishing of concrete: Lays out and marks measurements for assembly of new forms on prepared moulding floor, from blueprints and drawings. 2) Directs workers engaged in bolting or clamping together of forms and tightens bolts to attain prescribed tension on wire or cable reinforcing members, using wrench equipped with torque gauge. 3) Directs workers engaged in mixing and pouring of concrete into moulds. 4) Finishes concrete to impart uniform texture, using trowel, floats, and other hand tools or work aids. 5) Releases tension on reinforcing members during drying and curing process, using wrench, to impart slight arc and increase strength of concrete. 	<p><u>Bridge Structure Senior Supervisor</u></p> <ol style="list-style-type: none"> 1) Reporting to the Construction Manager. 2) Day-to-day management of the site, including supervising and monitoring the site labour force and the structural bridge works of any subcontractors to ensure within time and quality. 3) Planning the bridge project works work and efficiently organising the plant and site facilities to meet agreed deadlines. 4) Liaise with consultants on all site matters, e.g., timely issuance of construction drawings, follow up on drawings, amendments, etc. 5) Observe and ensure all equipment and procedures comply with safety regulations. 6) Coordinates with sub-contractors on details, sequence, and programme of works. 7) Ensuring that all materials used are within budgeted quantity and work performed are as per specifications. 8) Measurement and valuation in collaboration with Contracts Department where appropriate, providing data in respect of variation orders and site instructions. 	<p><u>Bridge Structure Senior Supervisor</u></p> <ol style="list-style-type: none"> 1) Conduct fieldwork to include inspecting, measuring and investigating the cause of deterioration and implementing a plan of action to ensure repairs are completed. 2) Meeting with construction staff and contractors while in the field during task development as needed. 3) Resolving issues in the field when construction problems arise. 4) Responsible for preparing bridge maintenance/rehabilitation designs and drawings for tasks and environmental sketches. 5) Investigate condition of existing structures and assist in developing scope of proposed bridge rehabilitations. 6) Analyse structures for safe load carrying capacity and perform structural calculations and load ratings to ensure soundness and compliance of structural elements. 7) Providing technical advice and coordination for district-wide structure maintenance contracts. 8) Assisting Bridge Maintenance Manager with scoping of work and priorities.
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			<ul style="list-style-type: none"> 9) Assisting in preparing contract proposals and coordinating work accomplishments by contract. 10) Provide technical advice and guidance to Contractors on methods and procedures of repair and rehabilitation. 11) Provide technical supervision for field operations. 12) Performing field checks and monitoring progress of structure maintenance work. 13) Providing detailed sketches and material quantity schedules for repairs. 14) Analyse District-wide bridge inventory and element data, review inspection reports and prioritise needs. 15) Performing contract management activities to include scoping and generating task orders, estimates, no-plan assemblies, details, plan sets, calculations, load ratings, railroad permits, environmental sketches, cross-discipline coordination, construction support, and field reviews. 16) Maintaining contract task backlogs; analysis of the inventory to identify, present, and address needs via internal mechanisms, existing
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			<p>contracts, or the need for a new contract.</p> <p>17) Developing new contracts and renewal of existing.</p> <p>18) Tracking costs and funding.</p>
LEVEL 3	<p><u>Pre & Post Tensioned Supervisor</u></p> <ol style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc) to determine work requirements. 6) Coordinate work activities. 7) Monitor usage of equipment on construction sites to verify safety and specification compliance. 8) Carry out regular work inspections. 9) Identify and request the requirement materials, manpower and machinery. 10) Attend technical and site meetings. 11) Compile site document or record to prepare report. 12) Raise site safety concerns and identify construction hazards and risks. 	<p><u>Bridge Structure Supervisor</u></p> <ol style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc.) to determine work requirements. 6) Coordinate work activities. 7) Monitor usage of equipment on construction sites to verify safety and specification compliance. 8) Carry out regular work inspections. 9) Identify and request the requirement materials, manpower and machinery. 10) Attend technical and site meetings. 11) Compile site document or record to prepare report. 12) Raise site safety concerns and identify construction hazards and risks. 13) Report site matters to superior or management. 	<p><u>Bridge Structure Supervisor</u></p> <ol style="list-style-type: none"> 1) Liaise with managers 2) Check compatibility of materials 3) Ensure compliance with construction project deadline 4) Coordinate construction activities 5) Inspect construction supplies 6) Supervise staff 7) Identify defects in concrete 8) Evaluate employee's work 9) Identify external risks to bridge integrity 10) Follow health and safety procedures in construction 11) Work in construction team 12) Plan resource allocation 13) Plan shifts of employees 14) Use safety equipment in construction 15) Conduct quality control analysis 16) React events in time-critical environments 17) Manage health and safety standards 18) Interpret 3D plans 19) Monitor stock level

	<p>13) Report site matters to superior or management. 14) Supervise subordinate work. 15) Supervise compliance of safety, health and environment requirements. 16) Arrange for maintenance activities. 17) Perform subordinate appraisal. 18) Conduct training for construction methods, operation of machinery and equipment, site safety requirements. 19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities, including QA QC documents, SHE documents.</p>	<p>14) Supervise subordinate work. 15) Supervise compliance of safety, health and environment requirements. 16) Arrange for maintenance activities. 17) Perform subordinate appraisal. 18) Conduct training for construction methods, operation of machinery and equipment, site safety requirements. 19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities, including QA QC documents, SHE documents.</p>	<p>20) Process incoming construction supplies 21) Interpret 2D plans 22) Secure working area 23) Prevent damage to utility infrastructure</p>
<p>LEVEL 2</p>	<p><u>Pre & Post Tensioned Crew</u> 1) Performs any combination of following duties involved in preparing forms and pouring concrete to make prestressed structural beams: Cleans forms, using hammer, scraper, and brush, and sprays form with oil to prevent adhesion of concrete. 2) Places reinforcing steel cage in form, using power winch. 3) Pushes stressing cables through form, threads end through guide</p>	<p><u>Bridge Structure Concreter</u> 1) Perform work as per construction drawing and method statement. 2) Carry out concreting work. 3) Carry out loading and unloading of material. 4) Carry out concreting work related to waterproofing. 5) Assist in carrying out sample testing. 6) Assist in taking concrete samples for testing. 7) Carry out concrete mixing. 8) Handle tools and equipment.</p>	<p><u>Bridge Structure Bar Benders</u> 1) Read and understand routine drawings/sketches and Bar Bending Schedule: - Basic concepts of drawings/sketches and Bar Bending Schedule used in routine works. 2) Use hand and power tools for cutting and bending of reinforcement: Selection and use of hand and power tools for reinforcement steel cutting and bending. 3) Prepare, fabricate, place, and fix reinforcement for R.C.C structures:</p>

	<p>holes in endplates, and clamps end of cables to plate.</p> <ol style="list-style-type: none"> 4) Tightens nuts at base of form with power wrench and inserts spacer bars and locking pins at intervals along top of form to maintain specified dimensions of form. 5) Clamps vibrators in holders on sides of forms. 6) Lays planks on protruding ends of spacer bars to make elevated walkway on both sides of form. 7) Lifts four-wheeled pouring buggy into position on walkway, using winch. 8) Lifts belt conveyor into position between pouring buggy and ready-mix truck with winch and bolts it to truck, using power wrench. 9) Starts conveyors and vibrators. 10) Shovels sample of concrete into canisters and tests consistency of concrete, using cone-shaped mould and trowel. 11) Pushes pouring buggy along walkway to follow ready-mix truck. 12) Settles concrete at the top of form with hand vibrator and fills low spots with concrete taken from conveyor. 	<ol style="list-style-type: none"> 9) Perform routine maintenance. 	<p>Methods and standard procedure for fabricating, placing, and fixing of reinforcement steel for R.C.C structures.</p> <ol style="list-style-type: none"> 4) Work effectively in a team to deliver desired results at the workplace: Organised working procedure within a team at site 5) Plan and organise work to meet expected outcomes: - Prioritising activities and organising resources to meet desired outcomes. 6) Work according to personal health, safety, and environment protocol at construction site: Importance of Health & Safety aspects & measures to be followed while working. 7) Work effectively in a team to deliver desired results at the workplace: - Organised working procedure within a team at site.
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	<p>13) Removes forms from cured beams, using hand tools, and cuts protruding end of stressing cable, using oxyacetylene torch.</p> <p>14) Lifts beam, using four-wheeled portable hoist, and moves hoist to yarding area by hand or with truck.</p> <p>15) Prepare forms and cast concrete lintels.</p>		
LEVEL 1	<p><u>General Workers</u></p> <p>1) Prepare tools, equipment, and machinery.</p> <p>2) Prepare materials.</p> <p>3) Assist site works according to instruction.</p> <p>4) Assist routine maintenance in accordance with routine schedule.</p> <p>5) Assist in materials loading and unloading activities.</p> <p>6) Assist to control the flow of traffic passing near, in or around work site.</p> <p>7) Perform housekeeping.</p> <p>8) Adhere to safety, health and environment regulation.</p>	<p><u>General Workers</u></p> <p>1) Prepare tools, equipment, and machinery.</p> <p>2) Prepare materials.</p> <p>3) Assist site works according to instruction.</p> <p>4) Assist routine maintenance in accordance with routine schedule.</p> <p>5) Assist in materials loading and unloading activities.</p> <p>6) Assist to control the flow of traffic passing near, in or around work site.</p> <p>7) Perform housekeeping.</p> <p>8) Adhere to safety, health and environment regulation.</p>	<p><u>General Workers</u></p> <p>1) Prepare tools, equipment, and machinery.</p> <p>2) Prepare materials.</p> <p>3) Assist site works according to instruction.</p> <p>4) Assist in routine maintenance in accordance with the routine schedule.</p> <p>5) Assist in materials loading and unloading activities.</p> <p>6) Assist to control the flow of traffic passing near, in or around work site.</p> <p>7) Perform housekeeping.</p> <p>8) Adhere to safety, health and environment regulation.</p>

Table 4.28: Group 421 Occupational Competencies (9 of 9)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	Bridge Structure (Rigging)	Bridge Bearing	Bridge Expansion Joint
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of procedure/work sequence for the project. 	No Job Title	No Job Title

	<ul style="list-style-type: none"> 7) Inspect or review project deliverables to monitor compliance with requirements. 8) Liaise and coordinate with consultant for submission to local authority for approval. 9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction work. 10) Participate in construction management process for smooth progress of construction works. 11) Coordinate constructions work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings. 		
<p>LEVEL 5</p>	<p><u>Site Engineer</u></p> <ul style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organise construction maintenance activities. 6) Interpret project brief to identify work sequence and appropriate construction method. 	<p>No Job Title</p>	<p>No Job Title</p>

	<ul style="list-style-type: none"> 7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project. 8) Prepare masterwork program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor, or related worker. 10) Identify and report any errors or discrepancies on construction drawings/shop drawings. 11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering. 12) Develop or implement quality control and environmental protection programme. 13) Prepare progress claim for construction work. 14) Prepare variation order. 15) Analyse and verify submission by coordinator. 16) Attend technical and site meetings. 17) Produce as-built drawings. 		
<p>LEVEL 4</p>	<p><u>Bridge Structure Senior Supervisor</u></p> <ul style="list-style-type: none"> 1) Reporting to the Construction Manager. 2) Day-to-day management of the site, including supervising and monitoring 	<p><u>Bridge Bearing Senior Supervisor</u></p> <ul style="list-style-type: none"> 1) Reporting to the Construction Manager. 2) Day-to-day management of the site, including supervising and monitoring 	<p><u>Expansion Joint Senior Supervisor</u></p> <ul style="list-style-type: none"> 1) Reporting to the Construction Manager.

	<p>the site labour force and the structural bridge works of any subcontractors to ensure within time and quality.</p> <ol style="list-style-type: none"> 3) Planning the bridge project works and efficiently organising the plant and site facilities to meet agreed deadlines. 4) Liaise with consultants on all site matters, e.g., timely issuance of construction drawings, follow up on drawings, amendments, etc. 5) Observe and ensure all equipment and procedures comply with safety regulations. 6) Coordinates with sub-contractors on details, sequence, and programme of works. 7) Ensuring that all materials used are within budgeted quantity and work performed are as per specifications. 8) Measurement and valuation in collaboration with Contracts Department where appropriate, providing data in respect of variation orders and site instructions. 	<p>the site labour force and the work of any subcontractors to ensure within time and quality.</p> <ol style="list-style-type: none"> 3) Planning the work and efficiently organising the plant and site facilities to meet agreed on deadlines. 4) Liaise with consultants on all site matters, e.g., timely issuance of construction drawings, follow up on drawings, amendments, etc. 5) Observe and ensure all equipment and procedures comply with safety regulations. 6) Coordinates with sub-contractors on details, sequence, and programme of works. 7) Ensuring that all materials used are within budgeted quantity and work performed are as per specifications. 8) Measurement and valuation in collaboration with Contracts Department where appropriate, providing data in respect of variation orders and site instructions. 	<ol style="list-style-type: none"> 2) Day-to-day management of the site, including supervising and monitoring the site labour force and the work of any subcontractors to ensure within time and quality. 3) Planning the work and efficiently organising the plant and site facilities to meet agreed on deadlines. 4) Liaise with consultants on all site matters, e.g., timely issuance of construction drawings, follow up on drawings, amendments, etc. 5) Observe and ensure all equipment and procedures comply with safety regulations. 6) Coordinates with sub-contractors on details, sequence, and programme of works. 7) Ensuring that all materials used are within budgeted quantity and work performed are as per specifications. 8) Measurement and valuation in collaboration with Contracts Department where appropriate, providing data in respect of variation orders and site instructions.
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LEVEL 3	<p><u>Bridge Structure Supervisor</u></p> <ol style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc.) to determine work requirements. 6) Coordinate work activities. 7) Monitor usage of equipment on construction sites to verify safety and specification compliance. 8) Carry out regular work inspections. 9) Identify and request the requirement materials, manpower and machinery. 10) Attend technical and site meetings. 11) Compile site document or record to prepare report. 12) Raise site safety concerns and identify construction hazards and risks. 13) Report site matters to superior or management. 14) Supervise subordinate work. 15) Supervise compliance of safety, health and environment requirements. 16) Arrange for maintenance activities. 17) Perform subordinate appraisal. 	<p><u>Bridge Bearing Supervisor</u></p> <ol style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc.) to determine work requirements. 6) Coordinate work activities. 7) Monitor usage of equipment on construction sites to verify safety and specification compliance. 8) Carry out regular work inspections. 9) Identify and request the requirement materials, manpower and machinery. 10) Attend technical and site meetings. 11) Compile site document or record to prepare report. 12) Raise site safety concerns and identify construction hazards and risks. 13) Report site matters to superior or management. 14) Supervise subordinate work. 15) Supervise compliance of safety, health, and environment requirements. 16) Arrange for maintenance activities. 17) Perform subordinate appraisal. 	<p><u>Expansion Joint Supervisor</u></p> <ol style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc.) to determine work requirements. 6) Coordinate work activities. 7) Monitor usage of equipment on construction sites to verify safety and specification compliance. 8) Carry out regular work inspections. 9) Identify and request the requirement materials, manpower and machinery. 10) Attend technical and site meetings. 11) Compile site document or record to prepare report. 12) Raise site safety concerns and identify construction hazards and risks.

	<p>18) Conduct training for construction methods, operation of machinery and equipment, site safety requirements.</p> <p>19) Troubleshoot and rectify within work scope.</p> <p>Prepare and compile reports for site activities, including QA QC documents, SHE documents.</p>	<p>18) Conduct training for construction methods, operation of machinery and equipment, site safety requirements.</p> <p>19) Troubleshoot and rectify within work scope.</p> <p>20) Prepare and compile reports for site activities, including QA QC documents, SHE documents.</p>	<p>13) Report site matters to superior or management.</p> <p>14) Supervise subordinate work.</p> <p>15) Supervise compliance of safety, health, and environment requirements.</p> <p>16) Arrange for maintenance activities.</p> <p>17) Perform subordinate appraisal.</p> <p>18) Conduct training for construction methods, operation of machinery and equipment, site safety requirements.</p> <p>19) Troubleshoot and rectify within work scope.</p> <p>20) Prepare and compile reports for site activities, including QA QC documents, SHE documents.</p>
<p>LEVEL 2</p>	<p><u>Bridge Structure Rigger</u></p> <p>1) Observe equipment gauges and indicators, and hand signals of other workers to verify load positions or depths.</p> <p>2) Move levers, pedals, and throttles to stop, start, and regulate speeds of hoist or winch drums in response to hand, bell, buzzer, telephone, loud-speaker, or whistle signals, or by observing dial indicators or cable marks.</p>	<p><u>Bridge Bearing Installer</u></p> <p>1) Install in accordance with the specifications of the bearing installation plan (dimensions, ground levels and positions, inclinations, lateral and longitudinal position, material quality of the bearing joint, pre-setting).</p> <p>2) Adjust bearing according to the position and direction in the layout as well as the height and slope in the elevation.</p>	<p><u>Expansion Joint Installer</u></p> <p>1) Responsible for taking measurements, cutting to exact specifications, and fitting and fastening the joint to the road depending on the customer requirements.</p> <p>2) Problem-solving will be key as most of the drywall or insulation is not measured to spec.</p> <p>3) Developing relationships with the General Contractor and</p>

	<ol style="list-style-type: none"> 3) Signal and assist other workers loading or unloading materials. 4) Start engines of hoists or winches and use levers and pedals to wind or unwind cable on drums. 5) Select loads or materials according to weight and size specifications. 6) Move or reposition hoists, winches, loads and materials, manually or using equipment and machines such as trucks, cars, and hand trucks. 7) Attach, fasten, and disconnect cables or lines to loads, materials, and equipment using hand tools. 8) Operate compressed air, diesel, electric, gasoline, or steam-driven hoists or winches to control movement of cableways, cages, derricks, draglines, loaders, railcars, or skips. 9) Repair, maintain and adjust equipment using hand tools. 10) Apply hand or foot brakes and move levers to lock hoists or winches. 11) Oil winch drums so that cables will wind smoothly. 12) Tend auxiliary equipment, such as jacks, slings, cables, or stop blocks to facilitate moving items or materials for further processing. 16) Climb ladders to position and set up vehicle-mounted derricks. 	<ol style="list-style-type: none"> 3) Use temporary supports to adjust the position of the bearing. The temporary supports under bearing plates shall be compressible under design loading (to avoid hard spots) if not removed once the bedding material has reached the required strength. Unless considered in the design of the structure and the bearings, the bearing shall be located so that its position does not deviate more than 3 mm (value is recommended by VHFL acc. prEN 1337-1) from its nominal position in any direction. 4) Install bearing horizontally. A deviation from the horizontal X and Y axis should not exceed 3 ‰ and 5 ‰ for elastomer bearings after casting. For sloped bridges, the structural engineer may prefer the bearings to be aligned in parallel to the local gradient. In any case, -the sliding plate and the lower part of the bearing shall be parallel (such that the gradient is not accommodated by the rotational element of the bridges) -the alignment of the bearings must match the alignment foreseen by the structural engineer Association of the manufacturers for expansion joints and bearings (VHFL) VHFL 	<p>subs to enlist their help in these situations will also be necessary.</p>
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		<p>Guideline 2 Information for construction sites: Installation of bridge bearings Edition 2020-04 9 The X-axis marked on the upper bearing plate must match with the displacement direction specified in the bearing installation plan.</p> <p>5) Ensure the maximum deviation from the nominal displacement direction in-plane shall not exceed 3 ‰.</p> <p>10) Check the direction of the pre-setting (red arrow on the upper bearing plate)</p>	
<p>LEVEL 1</p>	<p><u>General Workers</u></p> <ol style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist routine maintenance in accordance with routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist to control the flow of traffic passing near, in or around work site. 7) Perform housekeeping. 9) Adhere to safety, health and environment regulation. 	<p>No Job Title</p>	<p>No Job Title</p>

Table 4.29: Group 422 Occupational Competencies (1 of 3)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(422) CONSTRUCTION OF UTILITY PROJECTS		
AREA	Pipeline (Cutting / Joining)	Pipeline (Jacking)	Concrete Precast Panel
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of 	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of 	<p><u>Construction Manage</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of

	<p>procedure/work sequence for the project.</p> <p>7) Inspect or review project deliverables to monitor compliance with requirements.</p> <p>8) Liaise and coordinate with consultant for submission to local authority for approval.</p> <p>9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction work.</p> <p>10) Participate in construction management process for smooth progress of construction works.</p> <p>11) Coordinate constructions work according to Inspection Test Plan.</p> <p>12) Ensure SHE compliance.</p> <p>13) Represent company in meetings.</p>	<p>procedure/work sequence for the project.</p> <p>7) Inspect or review project deliverables to monitor compliance with requirements.</p> <p>8) Liaise and coordinate with consultant for submission to local authority for approval.</p> <p>9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction work.</p> <p>10) Participate in construction management process for smooth progress of construction works.</p> <p>11) Coordinate constructions work according to Inspection Test Plan.</p> <p>12) Ensure SHE compliance.</p> <p>13) Represent company in meetings.</p>	<p>procedure/work sequence for the project.</p> <p>7) Inspect or review project deliverables to monitor compliance with requirements.</p> <p>8) Liaise and coordinate with consultant for submission to local authority for approval.</p> <p>9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction work.</p> <p>10) Participate in construction management process for smooth progress of construction works.</p> <p>11) Coordinate constructions work according to Inspection Test Plan.</p> <p>12) Ensure SHE compliance.</p> <p>13) Represent company in meetings.</p>
<p>LEVEL 5</p>	<p><u>Site Engineer</u></p> <p>1) Plan, schedule, or coordinate site activities to meet deadlines.</p> <p>2) Prepare project costing and request budget estimates.</p> <p>3) Inspect or review project deliverables to monitor compliance with requirement</p> <p>4) Monitor work progress.</p> <p>5) Plan and organise construction maintenance activities.</p>	<p><u>Site Engineer</u></p> <p>1) Plan, schedule, or coordinate site activities to meet deadlines.</p> <p>2) Prepare project costing and request budget estimates.</p> <p>3) Inspect or review project deliverables to monitor compliance with requirement</p> <p>4) Monitor work progress.</p> <p>5) Plan and organise construction maintenance activities.</p>	<p><u>Site Engineer</u></p> <p>1) Plan, schedule, or coordinate site activities to meet deadlines.</p> <p>2) Prepare project costing and request budget estimates.</p> <p>3) Inspect or review project deliverables to monitor compliance with requirement</p> <p>4) Monitor work progress.</p> <p>5) Plan and organise construction maintenance activities.</p>

	<p>6) Interpret project brief to identify work sequence and appropriate construction method.</p> <p>7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.</p> <p>8) Prepare masterwork program/ project milestone.</p> <p>9) Direct and supervise construction contractor, sub-contractor, or related worker.</p> <p>10) Identify and report any errors or discrepancies on construction drawings/shop drawings.</p> <p>11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering.</p> <p>12) Develop or implement quality control and environmental protection programme.</p> <p>13) Prepare progress claim for construction work.</p> <p>14) Prepare variation order.</p> <p>15) Analyse and verify submission by coordinator.</p> <p>16) Attend technical and site meetings.</p> <p>17) Produce as-built drawings.</p>	<p>6) Interpret project brief to identify work sequence and appropriate construction method.</p> <p>7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.</p> <p>8) Prepare masterwork program/ project milestone.</p> <p>9) Direct and supervise construction contractor, sub-contractor, or related worker.</p> <p>10) Identify and report any errors or discrepancies on construction drawings/shop drawings.</p> <p>11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering.</p> <p>12) Develop or implement quality control and environmental protection programme.</p> <p>13) Prepare progress claim for construction work.</p> <p>14) Prepare variation order.</p> <p>15) Analyse and verify submission by coordinator.</p> <p>16) Attend technical and site meetings.</p> <p>17) Produce as-built drawings.</p>	<p>6) Interpret project brief to identify work sequence and appropriate construction method.</p> <p>7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.</p> <p>8) Prepare masterwork program/ project milestone.</p> <p>9) Direct and supervise construction contractor, sub-contractor, or related worker.</p> <p>10) Identify and report any errors or discrepancies on construction drawings/shop drawings.</p> <p>11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering.</p> <p>12) Develop or implement quality control and environmental protection programme.</p> <p>13) Prepare progress claim for construction work.</p> <p>14) Prepare variation order.</p> <p>15) Analyse and verify submission by coordinator.</p> <p>16) Attend technical and site meetings.</p> <p>17) Produce as-built drawings.</p>
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LEVEL 4	<p><u>Pipeline Coordinator</u></p> <ol style="list-style-type: none"> 1) Coordinate, plan and execute the Superior Rebuild Project. 2) Plan, organise direct, and control methods of construction. 3) Oversee and supervise contractors on site to ensure accuracy of work and that safety guideline are being followed. 4) Ensures OSBL coordinators bring RFI's to closure, and contractors work complies with project requirements, specifications and/or drawings. 5) Participate in construction incident investigation and corrective actions. 6) Order and maintain materials and equipment relevant to the construction site. 7) Provide input, monitor schedules, and predict any potential issues that may hinder project deadlines. 	<p><u>Pipeline Coordinator</u></p> <ol style="list-style-type: none"> 1) Coordinate, plan and execute the Superior Rebuild Project. 2) Plan, organise direct, and control methods of construction. 3) Oversee and supervise contractors on site to ensure accuracy of work and that safety guideline are being followed. 4) Ensures OSBL coordinators bring RFI's to closure, and contractors work complies with project requirements, specifications and/or drawings. 5) Participate in construction incident investigation and corrective actions. 6) Order and maintain materials and equipment relevant to the construction site. 7) Provide input, monitor schedules, and predict any potential issues that may hinder project deadlines. 	<p><u>Precast Panel Supervisor</u></p> <ol style="list-style-type: none"> 1) Coordinate, plan and execute the Superior Rebuild Project. 2) Plan, organise direct, and control methods of construction. 3) Oversee and supervise contractors on site to ensure accuracy of work and that safety guideline are being followed. 4) Ensures OSBL coordinators bring RFI's to closure, and contractors work complies with project requirements, specifications and/or drawings. 5) Participate in construction incident investigation and corrective actions. 6) Order and maintain materials and equipment relevant to the construction site. 7) Provide input, monitor schedules, and predict any potential issues that may hinder project deadlines.
LEVEL 3	<p><u>Pipeline Supervisor</u></p> <ol style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan, 	<p><u>Pipe Jacking Operator</u></p> <ol style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan, 	<p><u>Precast Panel Supervisor</u></p> <ol style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan,

	<p>method statement, construction drawing, etc.) to determine work requirements.</p> <ol style="list-style-type: none"> 6) Coordinate work activities. 7) Monitor usage of equipment on construction sites to verify safety and specification compliance. 8) Carry out regular work inspections. 9) Identify and request the requirement materials, manpower and machinery. 10) Attend technical and site meetings. 11) Compile site document or record to prepare report. 12) Raise site safety concerns and identify construction hazards and risks. 13) Report site matters to superior or management. 14) Supervise subordinate work. 15) Supervise compliance of safety, health, and environment requirements. 16) Arrange for maintenance activities. 17) Perform subordinate appraisal. 18) Conduct training for construction methods, operation of machinery and equipment, site safety requirements. 19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities, including QA QC documents, SHE documents. 	<p>method statement, construction drawing, etc.) to determine work requirements.</p> <ol style="list-style-type: none"> 6) Coordinate work activities. 7) Monitor usage of equipment on construction sites to verify safety and specification compliance. 8) Carry out regular work inspections. 9) Identify and request the requirement materials, manpower and machinery. 10) Attend technical and site meetings. 11) Compile site document or record to prepare report. 12) Raise site safety concerns and identify construction hazards and risks. 13) Report site matters to superior or management. 14) Supervise subordinate work. 15) Supervise compliance of safety, health, and environment requirements. 16) Arrange for maintenance activities. 17) Perform subordinate appraisal. 18) Conduct training for construction methods, operation of machinery and equipment, site safety requirements. 19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities, including QA QC documents, SHE documents. 	<p>method statement, construction drawing, etc.) to determine work requirements.</p> <ol style="list-style-type: none"> 6) Coordinate work activities. 7) Monitor usage of equipment on construction sites to verify safety and specification compliance. 8) Carry out regular work inspections. 9) Identify and request the requirement materials, manpower and machinery. 10) Attend technical and site meetings. 11) Compile site document or record to prepare report. 12) Raise site safety concerns and identify construction hazards and risks. 13) Report site matters to superior or management. 14) Supervise subordinate work. 15) Supervise compliance of safety, health, and environment requirements. 16) Arrange for maintenance activities. 17) Perform subordinate appraisal. 18) Conduct training for construction methods, operation of machinery and equipment, site safety requirements. 19) Troubleshoot and rectify within work scope.
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			20) Prepare and compile reports for site activities, including QA QC documents, SHE documents.
LEVEL 2	<p><u>Pipeline Fitter I</u></p> <ol style="list-style-type: none"> 1) Cut, thread, and hammer pipe to specifications, using tools such as saws, cutting torches, and pipe threaders and benders. 2) Assemble and secure pipes, tubes, fittings, and related equipment, according to specifications, by welding, brazing, cementing, soldering, and threading joints. 3) Attach pipes to walls, structures, and fixtures, such as radiators or tanks, using brackets, clamps, tools, or welding equipment. 4) Inspect, examine, and test installed systems and pipelines using pressure gauge, hydrostatic testing, observation, or other methods. 5) Measure and mark pipes for cutting and threading. 6) Layout full-scale drawings of pipe systems, supports, and related equipment, following blueprints. 7) Plan pipe system layout, installation, or repair according to specifications. 8) Select pipe sizes and types and related materials, such as supports, 	<p><u>Assistant Pipe Jacking Operator</u></p> <ol style="list-style-type: none"> 1) Able to operate pipe jacking machine through the control room; control of micro-tunnelling/pipe jacking machine 2) Ability to skilfully steer machine remotely below ground to the destination. 3) Ensure the projects are executed within the approved schedule and according to project parameters. Preparation, installation and dismantling of all equipment on site 4) Ensure preventive maintenance of all equipment is performed appropriately. 	No Job Title

	<p>hangers, and hydraulic cylinders, according to specifications.</p> <ol style="list-style-type: none">9) Cut and boreholes in structures, such as bulkheads, decks, walls, and mains, prior to pipe installation, using hand and power tools.10) Modify, clean, and maintain pipe systems, units, fittings, and related machines and equipment, following specifications and using hand and power tools.11) Install automatic controls used to regulate pipe systems.12) Turn valves to shut off steam, water, or other gases or liquids from pipe sections, using valve keys or wrenches.13) Remove and replace worn components.14) Prepare cost estimates for clients.15) Inspect work sites for obstructions and to ensure that holes will not cause structural weakness.16) Operate motorised pumps to remove water from flooded manholes, basements, or facility floors.17) Dip nonferrous piping materials in a mixture of molten tin and lead to obtain a coating that prevents erosion or galvanic and electrolytic action.		
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LEVEL 1	<u>Pipeline Fitter II</u> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist in routine maintenance in accordance with routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist to control the flow of traffic passing near, in or around work site. 7) Perform housekeeping. 8) Adhere to safety, health and environment regulation.	No Job Title	No Job Title
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Table 4.30: Group 422 Occupational Competencies (2 of 3)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(422) CONSTRUCTION OF UTILITY PROJECTS		
AREA	Drainage	Manholes (Brick Work)	Telecommunication Tower
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of 	No Job Title	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of

	<p>procedure/work sequence for the project.</p> <ol style="list-style-type: none"> 7) Inspect or review project deliverables to monitor compliance with requirements. 8) Liaise and coordinate with consultant for submission to local authority for approval. 9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction work. 10) Participate in construction management process for smooth progress of construction works. 11) Coordinate constructions work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings. 		<p>procedure/work sequence for the project.</p> <ol style="list-style-type: none"> 7) Inspect or review project deliverables to monitor compliance with requirements. 8) Liaise and coordinate with consultant for submission to local authority for approval. 9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction work. 10) Participate in construction management process for smooth progress of construction works. 11) Coordinate constructions work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings.
<p>LEVEL 5</p>	<p><u>Site Engineer</u></p> <ol style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organise construction maintenance activities. 	<p><u>Site Engineer</u></p> <ol style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organise construction maintenance activities. 	<p><u>Site Engineer</u></p> <ol style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organise construction maintenance activities.

	<p>6) Interpret project brief to identify work sequence and appropriate construction method.</p> <p>7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.</p> <p>8) Prepare masterwork program/project milestone.</p> <p>9) Direct and supervise construction contractor, sub-contractor, or related worker.</p> <p>10) Identify and report any errors or discrepancies on construction drawings/shop drawings.</p> <p>11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering.</p> <p>12) Develop or implement quality control and environmental protection programme.</p> <p>13) Prepare progress claim for construction work.</p> <p>14) Prepare variation order.</p> <p>15) Analyse and verify submission by coordinator.</p> <p>16) Attend technical and site meetings.</p> <p>17) Produce as-built drawings.</p>	<p>6) Interpret project brief to identify work sequence and appropriate construction method.</p> <p>7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.</p> <p>8) Prepare masterwork program/project milestone.</p> <p>9) Direct and supervise construction contractor, sub-contractor, or related worker.</p> <p>10) Identify and report any errors or discrepancies on construction drawings/shop drawings.</p> <p>11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering.</p> <p>12) Develop or implement quality control and environmental protection programme.</p> <p>13) Prepare progress claim for construction work.</p> <p>14) Prepare variation order.</p> <p>15) Analyse and verify submission by coordinator.</p> <p>16) Attend technical and site meetings.</p> <p>17) Produce as-built drawings.</p>	<p>6) Interpret project brief to identify work sequence and appropriate construction method.</p> <p>7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.</p> <p>8) Prepare masterwork program/project milestone.</p> <p>9) Direct and supervise construction contractor, sub-contractor, or related worker.</p> <p>10) Identify and report any errors or discrepancies on construction drawings/shop drawings.</p> <p>11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering.</p> <p>12) Develop or implement quality control and environmental protection programme.</p> <p>13) Prepare progress claim for construction work.</p> <p>14) Prepare variation order.</p> <p>15) Analyse and verify submission by coordinator.</p> <p>16) Attend technical and site meetings.</p> <p>17) Produce as-built drawings.</p>
LEVEL 4	<p><u>Drainage Coordinator</u></p> <p>1) Management of reactive drainage upgrade and renewal projects,</p>	<p><u>Drainage Coordinator</u></p> <p>1) Management of reactive drainage upgrade and renewal projects,</p>	<p><u>Telecommunication Tower Coordinator</u></p>

	<p>including investigation, scoping, design & construction.</p> <ol style="list-style-type: none"> 2) Maintenance renewal and responsibility of network cleaning. 3) Assist with water sensitive urban design, policy, and guidelines. 4) Building Permit & Planning Permit development application referrals for declaration of flood levels. 	<p>including investigation, scoping, design & construction.</p> <ol style="list-style-type: none"> 2) Maintenance renewal and responsibility of network cleaning. 3) Assist with water sensitive urban design, policy, and guidelines. 4) Building Permit & Planning Permit development application referrals for declaration of flood levels. 	<ol style="list-style-type: none"> 1) Provide high-level customer service to all staff and departments that you liaise with. 2) Oversee operations to ensure user satisfaction, project continuity, and internal consistency. 3) Pass on information to system users and offer advice on the most cost-effective and efficient services and equipment that's available to them. 4) Coordinate and facilitate internal technical training in certain departments. 5) Perform troubleshooting and maintenance of telecommunication systems. 6) Develop project schedules, plans, and processes, and ensure they live up to company standards. 7) Create routine project and progress reports. 8) Adhere to a budget and expenditure plan. Monitor and approve payments and purchases. Set financial targets and measure progress towards goals. 9) Perform necessary administrative work for your department. Update databases and documentation. 10) Gather information on user requirements to put together service, installation, and equipment orders.
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			11) Manage and coordinate department procurement.
LEVEL 3	<p><u>Drainage Supervisor</u></p> <ol style="list-style-type: none"> 1) To be responsible for directing drainage and sumps service work crews and assisting 2) Supervised and administration staff in the collection and distribution of contract timesheets and paperwork. 3) Liaison with client staff and members of the public for inspection and programming of activities. Daily 4) programming of plant, materials, subcontractors, and staff to achieve budget returns for the business and 5) compliance with criteria set out in the relative contract documents. 	<p><u>Drainage Supervisor</u></p> <ol style="list-style-type: none"> 1) To be responsible for directing drainage and sumps service work crews and assisting 2) Supervised and administration staff in the collection and distribution of contract timesheets and paperwork. 3) Liaison with client staff and members of the public for inspection and programming of activities. Daily 4) programming of plant, materials, subcontractors, and staff to achieve budget returns for the business and 5) compliance with criteria set out in the relative contract documents. 	<p><u>Telecommunication Tower Supervisor</u></p> <ol style="list-style-type: none"> 1. Perform site visits to inspect and observe that a wireless construction project is progressing according to the plans and specifications of the project 2. Responsible for the proper interpretation and compliance of the civil design plans 3. Coordinate materials testing, surveying services and other sub professional services that may be required 4. Drive scheduled activities and troubleshooting results 5. Identify unforeseen conditions or errors in the plans or specifications and communicate such to the attention of their manager or the client 6. Maintain an accurate set of field notes and daily diary with good data management skills 7. Ensure sound knowledge of specific plans and specifications, restrictions and right of ways, permits, test procedures, schedules, shop

			<p>drawings, utility locations and information related to the project</p> <ol style="list-style-type: none"> 8. Develop and maintain a professional working relationship with construction contractors or subcontractors, and the engineering/architectural design team 9. May be required to supervise less experienced staff 10. Prepare daily reports and interval progress reports along with progress photos and record documentation 11. Monitor and record contractor's work performance with the contract requirements and conduct final inspections, prepare punch lists and collect documentation for closing out of contracts
<p>LEVEL 2</p>	<p><u>Drainage Machine Operator</u></p> <ol style="list-style-type: none"> 1) Operate tools, equipment, and machinery. 2) Carry out construction works according to instruction and drawing. 3) Carry out routine maintenance in accordance with routine schedule. 4) Perform loading and unloading activities of materials. 5) Perform housekeeping. 	<p><u>Manholes Bricklayer</u></p> <ol style="list-style-type: none"> 1) Laying bricks 2) Applying or removing mortar with a trowel 3) Working accurately from detailed plans and specifications 4) Sealing foundations with damp-resistant materials 5) Using spirit levels and plumb lines to check building alignment 6) Using hand tools, power tools and brick-cutting machines 	<p><u>Telecommunication Tower Machine Operator</u></p> <ol style="list-style-type: none"> 1) Operate tools, equipment, and machinery. 2) Carry out construction works according to instruction and drawing. 3) Carry out routine maintenance in accordance with routine schedule. 4) Perform loading and unloading activities of materials. 5) Perform housekeeping.

	6) Adhere to safety, health, and environment regulation.	7) Constructing arches and ornamental brickwork 8) Repairing and maintaining building blocks 9) Measuring out build areas and setting out the first rows of bricks and damp course 10) Working outdoors on construction sites, in all weathers and at height.	6) Adhere to safety, health, and environment regulation.
LEVEL 1	<p><u>Drain Layer</u></p> <ol style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist routine maintenance in accordance with routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist to control the flow of traffic passing near, in or around work site. 7) Perform housekeeping. 8) Adhere to safety, health and environment regulation. 	<p><u>General Workers</u></p> <ol style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist routine maintenance in accordance with routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist to control the flow of traffic passing near, in or around work site. 7) Perform housekeeping. 8) Adhere to safety, health and environment regulation. 	<p><u>General Workers</u></p> <ol style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist routine maintenance in accordance with routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist to control the flow of traffic passing near, in or around work site. 7) Perform housekeeping. 8) Adhere to safety, health and environment regulation.

Table 4.31: Group 422 Occupational Competencies (3 of 3)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(422) CONSTRUCTION OF UTILITY PROJECTS		
AREA	Power Supply	Water Supply	Domestic Sewerage System
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of 	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution 	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of

	<p>procedure/work sequence for the project.</p> <ol style="list-style-type: none"> 7) Inspect or review project deliverables to monitor compliance with requirements. 8) Liaise and coordinate with consultant for submission to local authority for approval. 9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction work. 10) Participate in construction management process for smooth progress of construction works. 11) Coordinate constructions work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings. 	<p>of procedure/work sequence for the project.</p> <ol style="list-style-type: none"> 7) Inspect or review project deliverables to monitor compliance with requirements. 8) Liaise and coordinate with consultant for submission to local authority for approval. 9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction works. 10) Participate in construction management process for smooth progress of construction works. 11) Coordinate constructions work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings. 	<p>procedure/work sequence for the project.</p> <ol style="list-style-type: none"> 7) Inspect or review project deliverables to monitor compliance with requirements. 8) Liaise and coordinate with consultant for submission to local authority for approval. 9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction works. 10) Participate in construction management process for smooth progress of construction works. 11) Coordinate constructions work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings.
LEVEL 5	<p><u>Site Engineer</u></p> <ol style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organize construction maintenance activities. 	<p><u>Site Engineer</u></p> <ol style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organize construction maintenance activities. 	<p><u>Site Engineer</u></p> <ol style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organize construction maintenance activities.

	<ul style="list-style-type: none"> 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project. 8) Prepare masterwork program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor, or related worker. 10) Identify and report any errors or discrepancies on construction drawings/shop drawing. 11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering. 12) Develop or implement quality control and environmental protection programme. 13) Prepare progress claim for construction work. 14) Prepare variation order. 15) Analyse and verify submission by coordinator. 16) Attend technical and site meetings. 17) Produce as-built drawings. 	<ul style="list-style-type: none"> 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project. 8) Prepare masterwork program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor, or related worker. 10) Identify and report any errors or discrepancies on construction drawings/shop drawings. 11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering. 12) Develop or implement quality control and environmental protection programme. 13) Prepare progress claim for construction work. 14) Prepare variation order. 15) Analyse and verify submission by coordinator. 16) Attend technical and site meetings. 17) Produce as-built drawings. 	<ul style="list-style-type: none"> 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project. 8) Prepare masterwork program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor, or related worker. 10) Identify and report any errors or discrepancies on construction drawings/shop drawings. 11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering. 12) Develop or implement quality control and environmental protection programme. 13) Prepare progress claim for construction work. 14) Prepare variation order. 15) Analyse and verify submission by coordinator. 16) Attend technical and site meetings. 17) Produce as-built drawings.
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<p>LEVEL 4</p>	<p><u>Power Supply Coordinator</u></p> <ol style="list-style-type: none"> 1) Assists with short-term power supply utilization and assists the Risk and Resource Portfolio group with long-term resource planning. 2) Supports the management of the Renewable Energy Credit portfolio, including researching REC markets & RPS rules and regulations, facility registrations in renewable energy tracking systems, state commissions, and various certification programs, execution & negotiation of all REC transactions and corresponding documentation, and reporting & audits for all systems and REC authorities. 3) Supports the management of power supply needs for specific industrial customers, including but not limited to executing all market transactions of energy and capacity, implementation of new contracts for the power supply business unit, and providing weekly market knowledge on various pricing products. 4) Develops relationships with REC and power supply providers that support Wabash Valley Power’s overall power supply portfolio business model and growth. 	<p><u>Water Supply Coordinator</u></p> <ol style="list-style-type: none"> 1) Produces and maintains all information related to safety and compliance for water pipelines by reviewing the regulations; identifying the regulations; and communicating those regulations to field personnel. 2) Ensures compliance with the state, federal, local and department regulations by visiting job sites; evaluating work procedures for compliance; auditing safety performance; and identifying issues and working with the department management team to resolve. 3) Represents the Department and the City before regulatory bodies by presenting information; commenting on proposed rules and regulations; ensuring a thorough understanding of the regulations, and sharing/presenting that information to department staff. 4) Provides training to staff, contractors, and the public through various avenues such as meetings, email, videos and slideshows. 	<p><u>Coordinator</u></p> <ol style="list-style-type: none"> 1) Plan physical work activities. 2) Compile and analyse submissions by site supervisor. 3) Submit technical report and progress report and issue to superior. 4) Interpret approved construction drawings, specifications, and bill of quantity (BQ). 5) Coordinate and inspect shop drawing production. 6) Assist in identifying and reporting any errors or discrepancies on construction drawings/shop drawings. 7) Identify variation order. 8) Assist in preparing progress claims for construction work. 9) Attend technical and site meetings. 10) Identify and solve interfacing problems. 11) Assist in producing as-built drawings.
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	<ul style="list-style-type: none"> 5) Analyses portfolio activity, including monitoring market interface of Wabash Valley Power resources, reviewing power invoices, and assessing cost requirements. 6) Monitors and maintains appropriate registrations in organized markets for the Wabash Valley Power resources and loads. 7) Conducts special projects as assigned by Executive VP, Risk & Resources 8) May be required to perform other duties as assigned. 	<ul style="list-style-type: none"> 5) Performs investigations and responds to regulatory issues by communicating with representatives of various state and federal agencies. 6) Provides advice and assistance to the public by telephone and in-person and investigates complaints. 	
<p>LEVEL 3</p>	<p><u>Power Supply Supervisor</u></p> <ul style="list-style-type: none"> 1) Report directly to the Power Supply Construction Manager and is in charge of making sure that the relevant equipment is installed in conformity with the Basic and Detail Designs, the installation procedures, the QA/QC system, the Time Schedule in place and forecasted cost 2) Coordinate on all technical aspects with the Power Supply Line Installation Manager, the Engineering team, and his team of Detail Design, and with the procurement teams based in France and in Constantine. 3) Participate on the preparation of the Time Schedule. 	<p><u>Water Supply Supervisor</u></p> <ul style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc.) to determine work requirements. 6) Coordinate work activities. 7) Monitor usage of equipment on construction sites to verify safety and specification compliance. 8) Carry out regular work inspections. 	<p><u>Sewerage Civil and Structure Supervisor</u></p> <ul style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc.) to determine work requirements. 6) Coordinate work activities. 7) Monitor usage of equipment on construction sites to verify safety and specification compliance. 8) Carry out regular work inspections.

	<p>4) To implement his task, the Site Supervisor is responsible for defining the necessary resources (human and material).</p> <p>5) Organize the tasks in a competent and consistent way so that all key activities are properly controlled:</p> <p>6) Ensuring that or Main Power Station / Traction Power Substation / Light Power Substation / Switching Rooms / High Voltage / Direct Current / Low Voltage Control Cables installations comply with the documents and that quality requirement and deadlines are met</p> <p>7) Managing general weekly and daily schedules</p> <p>8) Managing Main Power Station / Traction Power Substation / Light Power Substation / Switching Rooms / Cables construction team and / or Main Power Station / Traction Power Substation / Light Power Substation / Switching Rooms / High Voltage/Direct Current / Low Voltage Control Cables Subcontractor on site</p> <p>9) Supervising works</p> <p>10) Ensuring that works meet the requirements of the construction documents</p>	<p>9) Identify and request the requirement materials, manpower and machinery.</p> <p>10) Attend technical and site meetings.</p> <p>11) Compile site document or record to prepare report.</p> <p>12) Raise site safety concerns and identify construction hazards and risks.</p> <p>13) Report site matters to superior or management.</p> <p>14) Supervise subordinate work.</p> <p>15) Supervise compliance of safety, health, and environment requirements.</p> <p>16) Arrange for maintenance activities.</p> <p>17) Perform subordinate appraisal.</p> <p>18) Conduct training for construction methods, operation of machinery and equipment, site safety requirements.</p> <p>19) Troubleshoot and rectify within work scope.</p> <p>20) Prepare and compile reports for site activities, including QA QC documents, SHE documents.</p>	<p>9) Identify and request the requirement materials, manpower and machinery.</p> <p>10) Attend technical and site meetings.</p> <p>11) Compile site document or record to prepare report.</p> <p>12) Raise site safety concerns and identify construction hazards and risks.</p> <p>13) Report site matters to superior or management.</p> <p>14) Supervise subordinate work.</p> <p>15) Supervise compliance of safety, health, and environment requirements.</p> <p>16) Arrange for maintenance activities.</p> <p>17) Perform subordinate appraisal.</p> <p>18) Conduct training for construction methods, operation of machinery and equipment, site safety requirements.</p> <p>19) Troubleshoot and rectify within work scope.</p> <p>20) Prepare and compile reports for site activities, including QA QC documents, SHE documents.</p>
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	<ol style="list-style-type: none"> 11) Ensuring that installation procedures are followed 12) Collecting, checking, and signing of related Main Power Station / Traction Power Substation / Light Power Substation Switching Rooms / High Voltage / Direct Current / Low Voltage Control Cables Installation Quality Records 13) Collecting and signing all teams' daily reports 14) Organizing the team under his authority 15) Ensuring that his team is efficient 16) Ensuring that safety rules are followed 17) Managing nonconformities relating to his activity 18) Collecting and signing daily reports relating to his activity and forwarding them to the Power Supply Construction Manager 19) Reporting to the Power Supply Construction Manager on the progress of jobs with which he is concerned. 20) Weekly works progress program control and associated reports. 21) Client complaints follow-up (nonconformity forms) 22) Quality Control and Health Safety indicators 		
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LEVEL 2	<p><u>Power Supply Machine Operator</u></p> <ol style="list-style-type: none"> 1) Operate tools, equipment, and machinery. 2) Carry out construction works according to instruction and drawing. 3) Carry out routine maintenance in accordance with routine schedule. 4) Perform loading and unloading activities of materials. 5) Perform housekeeping. 6) Adhere to safety, health, and environment regulation. 	<p><u>Water Supply Machine Operator</u></p> <ol style="list-style-type: none"> 1) Operate tools, equipment, and machinery. 2) Carry out construction works according to instruction and drawing. 3) Carry out routine maintenance in accordance with routine schedule. 4) Perform loading and unloading activities of materials. 5) Perform housekeeping. 6) Adhere to safety, health, and environment regulation. 	<p><u>Sewerage C & S Fitter</u></p> <ol style="list-style-type: none"> 1) Operate tools, equipment, and machinery. 2) Carry out construction works according to instruction and drawing. 3) Carry out routine maintenance in accordance with routine schedule. 4) Perform loading and unloading activities of materials. 5) Perform housekeeping. 6) Adhere to safety, health, and environment regulation.
LEVEL 1	<p><u>General Workers</u></p> <ol style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist routine maintenance in accordance to routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist to control the flow of traffic passing near, in or around work site. 7) Perform housekeeping. 8) Adhere to safety, health and environment regulation. 	<p><u>General Workers</u></p> <ol style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist routine maintenance in accordance to routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist to control the flow of traffic passing near, in or around work site. 7) Perform housekeeping. 8) Adhere to safety, health and environment regulation. 	<p><u>Sewerage C & S Installer</u></p> <ol style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist routine maintenance in accordance to routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist to control the flow of traffic passing near, in or around work site. 7) Perform housekeeping. 8) Adhere to safety, health and environment regulation.

Table 4.32: Group 429 Occupational Competencies (1 of 2)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(429) CONSTRUCTION OF OTHER CIVIL ENGINEERING PROJECTS		
AREA	Port/Harbour /Marinas	Airport Runway	Flood Mitigation System
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of 	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of 	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of

	<p>procedure/work sequence for the project.</p> <p>7) Inspect or review project deliverables to monitor compliance with requirements.</p> <p>8) Liaise and coordinate with consultant for submission to local authority for approval.</p> <p>9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction work.</p> <p>10) Participate in construction management process for smooth progress of construction works.</p> <p>11) Coordinate constructions work according to Inspection Test Plan.</p> <p>12) Ensure SHE compliance.</p> <p>13) Represent company in meetings.</p>	<p>procedure/work sequence for the project.</p> <p>7) Inspect or review project deliverables to monitor compliance with requirements.</p> <p>8) Liaise and coordinate with consultant for submission to local authority for approval.</p> <p>9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction works.</p> <p>10) Participate in construction management process for smooth progress of construction works.</p> <p>11) Coordinate constructions work according to Inspection Test Plan.</p> <p>12) Ensure SHE compliance.</p> <p>13) Represent company in meetings.</p>	<p>procedure/work sequence for the project.</p> <p>7) Inspect or review project deliverables to monitor compliance with requirements.</p> <p>8) Liaise and coordinate with consultant for submission to local authority for approval.</p> <p>9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction works.</p> <p>10) Participate in construction management process for smooth progress of construction works.</p> <p>11) Coordinate constructions work according to Inspection Test Plan.</p> <p>12) Ensure SHE compliance.</p> <p>13) Represent company in meetings.</p>
LEVEL 5	<p><u>Site Engineer</u></p> <p>1) Plan, schedule, or coordinate site activities to meet deadlines.</p> <p>2) Prepare project costing and request budget estimates.</p> <p>3) Inspect or review project deliverables to monitor compliance with requirement</p> <p>4) Monitor work progress.</p> <p>5) Plan and organize construction maintenance activities.</p>	<p><u>Site Engineer</u></p> <p>1) Plan, schedule, or coordinate site activities to meet deadlines.</p> <p>2) Prepare project costing and request budget estimates.</p> <p>3) Inspect or review project deliverables to monitor compliance with requirement</p> <p>4) Monitor work progress.</p> <p>5) Plan and organize construction maintenance activities.</p>	<p><u>Site Engineer</u></p> <p>1) Plan, schedule, or coordinate site activities to meet deadlines.</p> <p>2) Prepare project costing and request budget estimates.</p> <p>3) Inspect or review project deliverables to monitor compliance with requirement</p> <p>4) Monitor work progress.</p> <p>5) Plan and organize construction maintenance activities.</p>

	<p>6) Interpret project brief to identify work sequence and appropriate construction method.</p> <p>7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.</p> <p>8) Prepare masterwork program/project milestone.</p> <p>9) Direct and supervise construction contractor, sub-contractor, or related worker.</p> <p>10) Identify and report any errors or discrepancies on construction drawings/shop drawings.</p> <p>11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering.</p> <p>12) Develop or implement quality control and environmental protection programme.</p> <p>13) Prepare progress claim for construction work.</p> <p>14) Prepare variation order.</p> <p>15) Analyse and verify submission by coordinator.</p> <p>16) Attend technical and site meetings.</p> <p>17) Produce as-built drawings.</p>	<p>6) Interpret project brief to identify work sequence and appropriate construction method.</p> <p>7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.</p> <p>8) Prepare masterwork program/project milestone.</p> <p>9) Direct and supervise construction contractor, sub-contractor, or related worker.</p> <p>10) Identify and report any errors or discrepancies on construction drawings/shop drawings.</p> <p>11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering.</p> <p>12) Develop or implement quality control and environmental protection programme.</p> <p>13) Prepare progress claim for construction work.</p> <p>14) Prepare variation order.</p> <p>15) Analyse and verify submission by coordinator.</p> <p>16) Attend technical and site meetings.</p> <p>17) Produce as-built drawings.</p>	<p>6) Interpret project brief to identify work sequence and appropriate construction method.</p> <p>7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.</p> <p>8) Prepare masterwork program/project milestone.</p> <p>9) Direct and supervise construction contractor, sub-contractor, or related worker.</p> <p>10) Identify and report any errors or discrepancies on construction drawings/shop drawings.</p> <p>11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering.</p> <p>12) Develop or implement quality control and environmental protection programme.</p> <p>13) Prepare progress claim for construction work.</p> <p>14) Prepare variation order.</p> <p>15) Analyse and verify submission by coordinator.</p> <p>16) Attend technical and site meetings.</p> <p>17) Produce as-built drawings.</p>
LEVEL 4	<u>Port/Harbour /Marinas Coordinator</u>	<u>Airport Runway Coordinator</u>	<u>Flood Mitigation Coordinator</u>

	<ol style="list-style-type: none"> 1) Assist crew and staff with maritime QHSE-S related matters. 2) Are the liaison with vessel management. 3) Assist DPA/CSO in ISM and ISPS related matters. 4) Will carry out/accompany audits and inspections on board (short missions abroad). 5) Follow the implementation of the safety management system onboard the fleet. 6) Follow-up and implement relevant rules and regulations. 7) Will gather and analyze data from Port State Control, internal and external audits, dangerous situations, near misses and accidents and makes sure adequate corrective and preventive measures are implemented in order to improve the safety management system. 8) Report and communicate with projects about QHSE-S aspects of the vessels. 9) Think along with the marine operations department about QHSE-S improvement matters that concern the entire DEME fleet. 10) Assist crew and staff with maritime QHSE-S related matters. 	<ol style="list-style-type: none"> 1) Inspects airfield, safety zones, clear zones, approach zones, terminal, perimeter fence line and airport grounds for compliance with Federal Aviation Regulations, Transportation Security Administration Regulations, Airport Rules & Regulations, Airport Minimum Standards, leases, and agreements. 2) Assures that the airport is operated in a safe and secure manner within the position's limited responsibilities. 3) Coordinates repair of all airport's damaged property found in inspections. 4) Ascertains that repair meets pre-set specifications. 5) Monitors ground transportation operations and overall program. Plans, directs, and coordinates all non-routine airfield activity (i.e., reassigning air carrier gate positions; opening and closing runways and taxiways; static displays; dignitary arrivals and departures; construction projects; escorts). 6) Identifies and determines general nature and extent of problems; determines location; assesses 	<ol style="list-style-type: none"> 1) Direct and manage a staff of professional and technical personnel 2) Oversee the review and approval of site plans, drainage reports, and geotechnical reports for infrastructure projects by other government agencies, private sector residential subdivision and commercial developments, and other related projects to confirm compliance with the district's criteria and policies 3) Oversee the research of letter files, design reports, aerial photos, record drawings, and other resources to support plan review efforts 4) Oversee the review of variance requests to the criteria and obtain variance approval if necessary 5) Use appropriate engineering discretion to review and approve deviations from specified development reports, plans, designs, and technical submittals to ensure compliance with District's policies, criteria, and objectives 6) Ensure accurate entry of data and archiving of drainage reports, plan reviews, and associated documents 7) Facilitate communications to explain the district's criteria, policies, and objectives with design
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	<ul style="list-style-type: none"> 11) Are the liaison with vessel management. 12) Assist DPA/CSO in ISM and ISPS related matters. 13) Will carry out/accompany audits and inspections on board (short missions abroad). 14) Follow the implementation of the safety management system onboard the fleet. 15) Follow-up and implement relevant rules and regulations. 16) Will gather and analyze data from Port State Control, internal and external audits, dangerous situations, near misses and accidents and makes sure adequate corrective and preventive measures are implemented in order to improve the safety management system. 17) Report and communicate with projects about QHSE-S aspects of the vessels. 18) Think along with the marine operations department about QHSE-S improvement matters that concern the entire DEME fleet. 	<p>problem urgency; and determines priorities in order to relay information on a timely basis.</p> <ul style="list-style-type: none"> 7) Contacts appropriate agencies by telephone or radio to obtain assistance. 8) Develops quality and productivity improvement capabilities to improve services and effectiveness. Maintains logs, records, and prepares reports. Issue Notice of Violations and parking citations as necessary. Utilizes checklists in the performance of duties. 9) Assists with coordination of simulated disaster drill and tabletop exercises, round table discussion follow-up and evaluation. 	<p>engineers, developers, other agencies, municipalities, and the public by telephone, letter, plan mark-ups, and direct meetings</p> <ul style="list-style-type: none"> 8) Coordinate and oversee the review and routing of plans, drainage reports, and geotechnical reports among different departments within the district 9) Perform field visits as necessary to identify unique site conditions that will affect the design of proposed work within the district's rights-of-way and to confirm compliance with the district's design criteria and standards 10) Advise management of problems and prepare recommendations for solutions using best practices 11) Prepare correspondence, complete forms, and maintain records and files related to work activities 12) Assure personnel compliance with District policies and procedures concerning the execution of duties and job performance 13) Assist in performing periodic personnel reviews and recommend adjustments 14) Attend department staff meetings and public meetings
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<p>LEVEL 3</p>	<p><u>Port/Harbour /Marinas Supervisor</u></p> <ul style="list-style-type: none"> 1) Coordinating and managing the staff team + specialist sub-contractors 2) Creating and managing team schedules, issues, and disputes 3) Follow all site safety requirements to ensure the safety and wellbeing management of all stakeholders 4) Keeping the project resourced with plant and materials 5) Monitoring productivity and providing feedback 6) Problem-solving 7) Monitoring and controlling all aspects of OH&S 	<p><u>Airport Runway Supervisor</u></p> <ul style="list-style-type: none"> 1) Identifies and anticipates operational, safety and security concerns by inspecting all areas of the airport, including airside, landside, and terminal facilities. 2) Maintains satisfactory conditions of airside, landside, and terminal facilities by creating work orders and performing light maintenance duties. 3) Supervises and performs airside operations activities including, but not limited to, identifying, preventing, responding to and/or removing all hazards to aviation. 	<p><u>Flood Mitigation Supervisor</u></p> <ul style="list-style-type: none"> 1) Plans, organize and manages all activities and duties of the Flood Control District Division, including floodplain management and flood control project management. 2) Supervises the engineering activities of the Flood Control District. 3) Inspects, studies, analyses, and formulates proposals on flood control and drainage problems. 4) Performs site inspections of major and minor flood and drainage problems.

	<p>8) Providing reports on works completed</p>	<p>4) Supervises snow removal operations during assigned shifts. 5) Inspects and maintains a record of all aeronautical areas, including pavement, markings, lighting, safety areas, wildlife, construction, emergency equipment and fuelling practices. 6) Coordinates construction and maintenance on or near the airport to ensure minimum interference with airport operations. 7) Responsible for issuing airport identification badges to all airport users. 8) Performs weather observations as required. 9) Conducts thorough terminal inspections and occasionally performs janitorial duties. 10) Supervises and coordinates any contract services related to airport operations. 11) Be physically present in attendance at the worksite. 12) Perform all work duties and activities in accordance with City policies and procedures. 13) Performs other duties as assigned by the Airport Coordinator.</p>	<p>5) Prepares reports, sketches, and drawings. 6) Performs contract administration for the delivery of planning, design, and construction services. 7) Assists in the development and analysis of cost data, engineering proposals and alternatives, and division operating budgets. 8) Coordinates assigned activity with overall departmental services involved in engineering projects. 9) Coordinates were continuing education programs for staff. 10) Performs related work as required. 11) Communicates and acts in a professional manner with the public, co-workers, and work contacts. 12) Review work of peers and subordinated in the Flood Control office for accuracy and completeness.</p>
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LEVEL 2	<p><u>Port/Harbour/Marinas Machine Operator</u></p> <ol style="list-style-type: none"> 1) Operate tools, equipment, and machinery. 2) Carry out construction works according to instruction and drawing. 3) Carry out routine maintenance in accordance with routine schedule. 4) Perform loading and unloading activities of materials. 5) Perform housekeeping. 6) Adhere to safety, health, and environment regulation. 	<p><u>Machine Operator</u></p> <ol style="list-style-type: none"> 1) Operate tools, equipment, and machinery. 2) Carry out construction works according to instruction and drawing. 3) Carry out routine maintenance in accordance with routine schedule. 4) Perform loading and unloading activities of materials. 5) Perform housekeeping. 6) Adhere to safety, health, and environment regulation. 	<p><u>Flood Mitigation Machine Operator</u></p> <ol style="list-style-type: none"> 1) Operate tools, equipment, and machinery. 2) Carry out construction works according to instruction and drawing. 3) Carry out routine maintenance in accordance with routine schedule. 4) Perform loading and unloading activities of materials. 5) Perform housekeeping. 6) Adhere to safety, health, and environment regulation.
LEVEL 1	<p><u>General Workers</u></p> <ol style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist routine maintenance in accordance with routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist to control the flow of traffic passing near, in or around work site. 7) Perform housekeeping. 8) Adhere to safety, health, and environment regulation. 	<p><u>General Workers</u></p> <ol style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist routine maintenance in accordance with routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist to control the flow of traffic passing near, in or around work site. 7) Perform housekeeping. 8) Adhere to safety, health and environment regulation. 	<p><u>General Workers</u></p> <ol style="list-style-type: none"> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist routine maintenance in accordance with routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist to control the flow of traffic passing near, in or around work site. 7) Perform housekeeping. 8) Adhere to safety, health and environment regulation.

Table 4.33: Group 429 Occupational Competencies (2 of 2)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(429) CONSTRUCTION OF OTHER CIVIL ENGINEERING PROJECTS		
AREA	Dams / Dykes	River works	Sport Facilities
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title	No Job Title
LEVEL 6	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of 	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of 	<p><u>Construction Manager</u></p> <ol style="list-style-type: none"> 1) Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. 2) Review project costing and request budget estimates. 3) Review and ensure construction layout design in terms of functionality, buildability, maintainability, cost-efficient and sustainability aspect are complied with. 4) Interpret project brief to identify work sequence and appropriate construction method. 5) Prepare work program. 6) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.

	<p>procedure/work sequence for the project.</p> <ol style="list-style-type: none"> 7) Inspect or review project deliverables to monitor compliance with requirements. 8) Liaise and coordinate with consultant for submission to local authority for approval. 9) Liaise with client, consultant, supplier, contractor, sub-contractor and all relevant parties for all construction works. 10) Participate in construction management process for smooth progress of construction works. 11) Coordinate constructions work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings. 	<p>procedure/work sequence for the project.</p> <ol style="list-style-type: none"> 7) Inspect or review project deliverables to monitor compliance with requirements. 8) Liaise and coordinate with consultant for submission to local authority for approval. 9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction works. 10) Participate in construction management process for smooth progress of construction works. 11) Coordinate constructions work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings. 	<ol style="list-style-type: none"> 7) Inspect or review project deliverables to monitor compliance with requirements. 8) Liaise and coordinate with consultant for submission to local authority for approval. 9) Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction works. 10) Participate in construction management process for smooth progress of construction works. 11) Coordinate constructions work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings.
LEVEL 5	<p><u>Site Engineer</u></p> <ol style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organize construction maintenance activities. 	<p><u>Site Engineer</u></p> <ol style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organize construction maintenance activities. 	<p><u>Site Engineer</u></p> <ol style="list-style-type: none"> 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates. 3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organize construction maintenance activities.

	<ul style="list-style-type: none"> 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project. 8) Prepare masterwork program/project milestone. 9) Direct and supervise construction contractor, sub-contractor, or related worker. 10) Identify and report any errors or discrepancies on construction drawings/shop drawings. 11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering. 12) Develop or implement quality control and environmental protection programme. 13) Prepare progress claim for construction work. 14) Prepare variation order. 15) Analyse and verify submission by coordinator. 16) Attend technical and site meetings. 17) Produce as-built drawings. 	<ul style="list-style-type: none"> 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project. 8) Prepare masterwork program/project milestone. 9) Direct and supervise construction contractor, sub-contractor, or related worker. 10) Identify and report any errors or discrepancies on construction drawings/shop drawings. 11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering. 12) Develop or implement quality control and environmental protection programme. 13) Prepare progress claim for construction work. 14) Prepare variation order. 15) Analyse and verify submission by coordinator. 16) Attend technical and site meetings. 17) Produce as-built drawings. 	<ul style="list-style-type: none"> 6) Interpret project brief to identify work sequence and appropriate construction method. 7) Interpret method statement to determine and monitor execution of procedure/work sequence for the project. 8) Prepare masterwork program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor, or related worker. 10) Identify and report any errors or discrepancies on construction drawings/shop drawings. 11) Propose technical solutions to resolve discrepancies on construction drawing/shop drawing/value engineering. 12) Develop or implement quality control and environmental protection programme. 13) Prepare progress claim for construction work. 14) Prepare variation order. 15) Analyse and verify submission by coordinator. 16) Attend technical and site meetings. 17) Produce as-built drawings.
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LEVEL 4	<p><u>Dams / Dykes Coordinator</u></p> <ol style="list-style-type: none"> 1) To plan and source material for dyke construction. 2) To plan and organize daily/weekly work planning schedule. 3) To coordinate with consultants on method statement, specifications, and shop drawing approval. 4) To manage and plan for site equipment and coordinate with stakeholders. 5) To supervise quantity surveying work (BOQ) for top management approval. 6) To train staff on work procedure, technical knowledge, and Skill to improve work performance. 7) To perform other relevant tasks as required by supervisor. 8) Performa other duties assigned by Project Manager 	<p><u>River works Coordinator</u></p> <ol style="list-style-type: none"> 1) Responsible for developing a watershed management plan for the River in a manner that is inclusive of all stakeholders. 2) Work closely with government agencies, non-profits, and individual citizens in the community to develop the plan. 3) Organize and facilitate steering committee meetings, arrange logistics for public meetings, prepare draft plan documents, coordinate volunteers, and collect water samples as necessary. 	<p><u>Sports Facilities Coordinator</u></p> <ol style="list-style-type: none"> 1) Coordinate the use of all assigned athletic facilities, including facility scheduling and staffing, supervising and monitoring of daily operations, planning and coordinating of maintenance and repairs, and the like. 2) Plan, implement, supervise and coordinate an aquatic program for the College, including program budget planning and administration, instructional programming, programming for the college community, lifeguard training, and the like. 3) Select, train and supervise the activities of 10 to 25 student lifeguards and facilities/athletic program assistants. 4) Play a key role in overall program and operating policy/procedure planning involving athletic facilities. 5) Ensure that proper health and safety practices are adhered to by facilities users and staff. Confer regularly with supervisor, other athletics staff and other college personnel to plan, coordinate and evaluate activities/programs/facilities, exchange information, investigate and resolve problems, and the like.
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<p>LEVEL 3</p>	<p><u>Dam / Dykes Supervisor</u></p> <ol style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc.) to determine work requirements. 6) Coordinate work activities. 7) Monitor usage of equipment on construction sites to verify safety and specification compliance. 8) Carry out regular work inspections. 9) Identify and request the requirement materials, manpower and machinery. 10) Attend technical and site meetings. 11) Compile site document or record to prepare report. 	<p><u>River Work Supervisor</u></p> <ol style="list-style-type: none"> 1) Assist in planning physical work activities in respective trade. 2) Prepare daily work schedule. 3) Assign work based on job tasks. 4) Brief workers on work procedures. 5) Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc.) to determine work requirements. 6) Coordinate work activities. 7) Monitor usage of equipment on construction sites to verify safety and specification compliance. 8) Carry out regular work inspections. 9) Identify and request the requirement materials, manpower and machinery. 10) Attend technical and site meetings. 11) Compile site document or record to prepare report. 	<p><u>Sports Facilities Supervisor</u></p> <ol style="list-style-type: none"> 1) Always maintain the highest level of integrity for yourself and the department 2) Actively seeking opportunities to improve yourself and the department 3) Enforcing all policies of the Rec SportsPlex, Main Campus Fields, Westside Courts, Tully Gymnasium, Harkins Turf Field, and Speicher Tennis Centre 4) Assisting the professional staff with the facility operations 5) Opening and closing procedures at Competitive Sports Facilities 6) Supervising open recreation, special events, Sport Club practices, Intramural Sports, and facility reservations shifts 7) Being a good steward of customer service 8) Preparing equipment and the facility for the programmed activities

	<ul style="list-style-type: none"> 12) Raise site safety concerns and identify construction hazards and risks. 13) Report site matters to superior or management. 14) Supervise subordinate work. 15) Supervise compliance of safety, health, and environment requirements. 16) Arrange for maintenance activities. 17) Perform subordinate appraisal. 18) Conduct training for construction methods, operation of machinery and equipment, site safety requirements. 19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities, including QA QC documents, SHE documents. 	<ul style="list-style-type: none"> 12) Raise site safety concerns and identify construction hazards and risks. 13) Report site matters to superior or management. 14) Supervise subordinate work. 15) Supervise compliance of safety, health, and environment requirements. 16) Arrange for maintenance activities. 17) Perform subordinate appraisal. 18) Conduct training for construction methods, operation of machinery and equipment, site safety requirements. 19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities, including QA QC documents, SHE documents. 	<ul style="list-style-type: none"> 9) Making decisions concerning the safety of participants pertaining to the playing conditions 10) Reporting potential risk management concerns, damages, and other maintenance issues 11) Maintaining clean facilities and empty trash cans 12) Leading the entire supervisory staff in closing the facility after a programmed shift 13) Handling all facility-related issues and documents as necessary 14) Serving as a liaison to the FSU Police and First Responders on site 15) Communicating any problem participants, facility issues, and other pertinent issues at Competitive Sports Facilities to the supervisory staff 16) Participating in discussion at weekly staff meetings
LEVEL 2	<p><u>Dams/ Dykes Machine Operator</u></p> <ul style="list-style-type: none"> 1) Operate tools, equipment, and machinery. 2) Carry out construction works according to instruction and drawing. 3) Carry out routine maintenance in accordance with routine schedule. 4) Perform loading and unloading activities of materials. 	<p><u>River Works Machine Operator</u></p> <ul style="list-style-type: none"> 1) Operate tools, equipment, and machinery. 2) Carry out construction works according to instruction and drawing. 3) Carry out routine maintenance in accordance with routine schedule. 4) Perform loading and unloading activities of materials. 	<p><u>Machine Operator</u></p> <ul style="list-style-type: none"> 1) Operate tools, equipment, and machinery. 2) Carry out construction works according to instruction and drawing. 3) Carry out routine maintenance in accordance with routine schedule. 4) Perform loading and unloading activities of materials. 5) Perform housekeeping.

	<p>5) Perform housekeeping. 6) Adhere to safety, health, and environment regulation.</p>	<p>5) Perform housekeeping. 6) Adhere to safety, health, and environment regulation.</p>	<p>6) Adhere to safety, health, and environment regulation.</p>
LEVEL 1	<p><u>General Workers</u> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist routine maintenance in accordance with routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist to control the flow of traffic passing near, in or around work site. 7) Perform housekeeping. 8) Adhere to safety, health and environment regulation.</p>	<p><u>General Workers</u> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist routine maintenance in accordance with routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist to control the flow of traffic passing near, in or around work site. 7) Perform housekeeping. 8) Adhere to safety, health and environment regulation.</p>	<p><u>General Workers</u> 1) Prepare tools, equipment, and machinery. 2) Prepare materials. 3) Assist site works according to instruction. 4) Assist routine maintenance in accordance with routine schedule. 5) Assist in materials loading and unloading activities. 6) Assist to control the flow of traffic passing near, in or around work site. 7) Perform housekeeping. 8) Adhere to safety, health and environment regulation.</p>

4.3.4 Analysis of the Competency in Demand in Civil Engineering Industry

This section explains the CiD in civil engineering industry. Prior to the development of CiD, the list of Occupational Competencies (OC) that resulted from the FGD is provided in 4.3.3. CiD in this study is presented into three work levels of (1) Skilled Workers, (2) Semi-skilled Workers, and (3) Low-skilled Workers. Details findings pertaining to competency skills and description gathered from the FGD participants is shown in Table 4.34, and the survey administered to respondents is shown in Table 4.35.

Table 4.34: Table of Competency in Demand in Civil Engineering from Participants

NO.	WORK LEVEL	COMPETENCY SKILL	DESCRIPTION
1.	Low-skilled Workers	Technical skills	The abilities and knowledge needed to perform specific tasks.
		Basic Communication Skill	Speaking, listening, and reading capabilities.
		Safety Skill	Avoiding situations that may cause harm to themselves or others, fire safety skills, and knowledge site signs.
		Team Working Skill	Understood as the willingness of a group of tasks to work together to achieve a task aim.
2.	Semi-skilled Workers	Machinery Knowledge & Skill	Skills and knowledge for used and maintenance Workers for Machinery on construction site.
		Communication Skill	Speaking, writing, listening, reading, and presenting ideas to make a lasting impression on the project team.
		Leadership Skill	Motivating team members and low skilled workers, inspiring them and fostering enthusiasm for projects.
		Health and Safety skill	Avoiding situations that may cause harm to themselves or others, "stranger awareness,"

			fire safety skills, and knowledge of project signs.
3.	Skilled Workers	Engineering Skill	Should be good at construction method, math, physic and understand the importance of following the data when making design decisions
		Organizational Skill	Ability to be systematic, efficient, and demonstrated by planning your time, quality, and cost of the project effectively
		Decision Skill	Demonstrate your ability to choose between two or more options by processing all relevant information and speaking with the appropriate points of contact in a given situation.
		Problem Solving Skill	Help to determine why an issue is happening and how to resolve that issue.
		Digital Skill	The use of new technology to solve the issues Include BIM, AI and others.
		Writing and reporting Skills.	Understand the purpose of the report brief and adhere to its specifications. Regular writing on schedule reports of construction projects required.

Details findings gathered from 270 respondents with regards to CiD are shown in Table 4.35. From the four Likert Scale of Not in Demand (ND), Low in Demand (LD), Mid in Demand (MD), and High in Demand (HD), the illustration of CiD is further highlighted in Figure 4.9.

Table 4.35: Table of Competency in Demand in Civil Engineering from Respondents

NO.	COMPETENCY	ND [%]	LD [%]	MD [%]	HD [%]
1.	Technical knowledge and skills.	0	2.2	24.4	73.4
2.	Communication skills.	0	1.1	27.8	71.1
3.	Leadership skills.	1.1	1.1	35.6	62.2
4.	Administrative and managerial skills.	0	6.7	36.7	56.6
5.	Analytical skills.	0	5.6	32.2	62.2
6.	Diagnostic and troubleshooting skills.	0	2.2	37.8	60.0
7.	Problem-solving skills.	0	0	35.6	64.4
8.	Product knowledge.	0	4.4	44.4	51.2
9.	Quality assurance and quality control knowledge.	0	2.2	45.6	52.2
10.	Computer literacy.	0	4.4	50.0	45.6
11.	Construction method knowledge.	0	2.2	40.0	57.8
12.	Knowledge of other tools and devices.	0	7.8	54.4	37.8
13.	Integrity.	0	1.1	28.9	70.0
14.	Strong technical aptitude/manual.	0	4.4	42.2	53.4
15.	Planning and forecasting abilities.	0	1.1	48.9	50.0
16.	General attitude towards work (commitment, resourcefulness, teamwork, etc.).	0	1.1	33.3	65.6

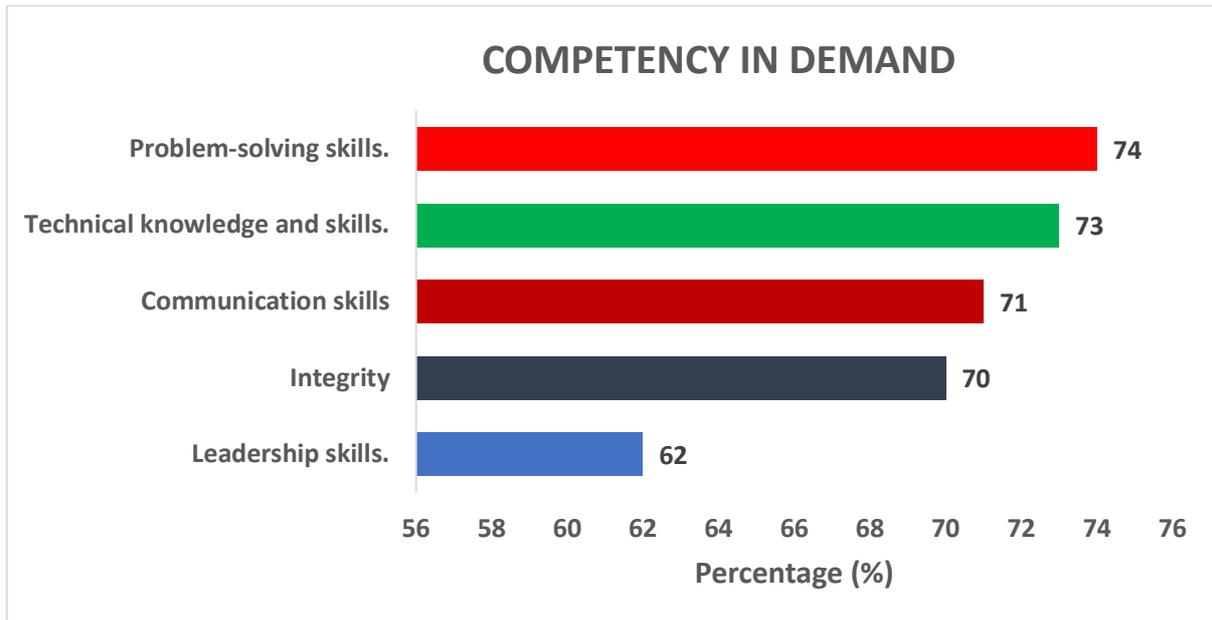


Figure 4.9: Competency in Demand in Civil Engineering from Respondents

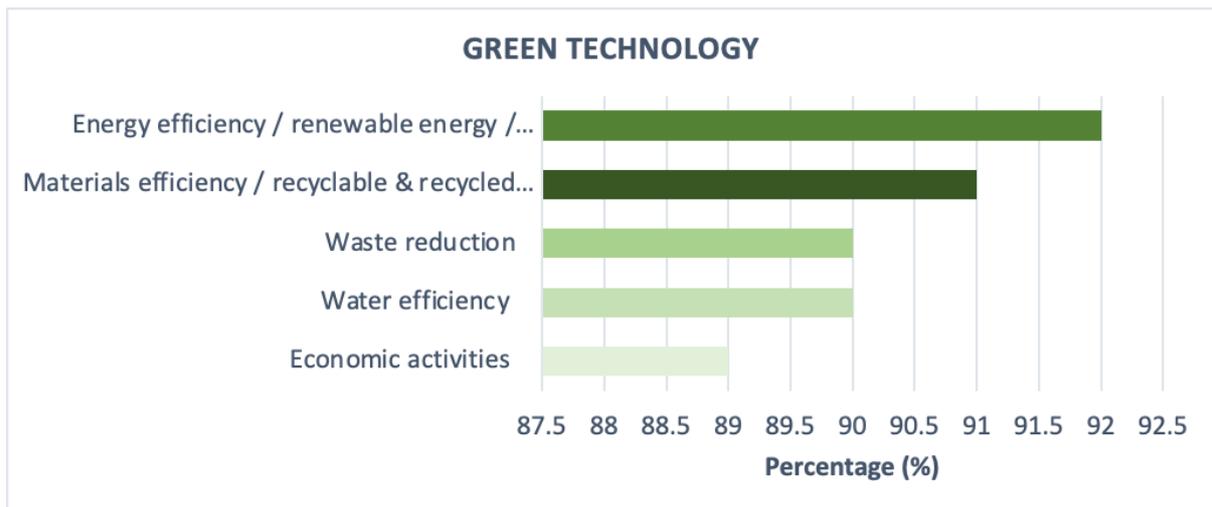
4.3.5 Analysis of Job Title Relevant to IR4.0 and Green Technology in Civil Engineering Study

This section explains the list of JT relevant to IR4.0 and green technology in civil engineering study.

Out of 270 respondents, findings indicated that 90% agree that green technology would have an impact on the economic activities of Civil Engineering. The issues related to green technology is shown in Table 4.36. It is highlighted that energy efficiency/renewable energy/minimization of energy is the highest green technology relevant to IR4.0, as shown in Figure 4.10.

Table 4.36: Table of Green Technology Issues

NO.	GREEN TECHNOLOGY	CIVIL ENGINEERING JOB AREA	
		Yes [%]	No [%]
1..	Energy efficiency / renewable energy/minimization of energy (i.e., solar charging system)	91.9	8.1
2.	Water efficiency (i.e., rainwater harvesting)	90.0	10.0
3.	Materials efficiency / recyclable & recycled products (i.e.: reuse construction waste)	91.1	8.9
4.	Waste reduction (i.e., reduce construction mistakes)	90.0	10.0

**Figure 4.10: Highest Green Technology Relevant to IR4.0**

The needs of emerging skills are crucial in the midst of IR4.0. Table 4.37 describes Job Title Related to IR4.0 & Green Technology.

Table 4.37: Table of JobTitle Related to IR4.0 & Green Technology

NO.	EMERGING SKILLS	JOB TITLES RELATED TO IR4.0 & GREEN TECHNOLOGY	REASON OF REQUIRED EMERGING SKILLS
1.	Digital Drawing (Digital Skills, Cloud Computing, Internet Of Thing)	Supervisor Site Engineer Construction Manager Project Manager	Paperless Government Requirements (BIM) Accessibility Easy To Share
2.	Instrumentation Skill	Machinery Operator Machinery Supervisor Site Engineer	Responsible On-Site Troubleshooting Minor Modification On-Site
3.	Risk Management Skill	Site Engineer Construction Manager Project Manager	Manage Quality Problems Manage Costing Problems Manage Timing Problems
4.	Remote Worksites And Mobile Access	Supervisor Site Engineer Construction Manager Project Manager	CCTV Barcode, RFID And QR Code
5.	Environmental Skill/Schedule Waste Management Skills	Supervisor Site Engineer Construction Manager Project Manager	DOE Requirement
6.	Autonomous Robots Skill	Site Engineer Construction Manager Project Manager	Pipeline Construction And Maintenance Sewerage

Out of 270 respondents, findings indicated that 94.40% agree that IR4.0 would have an impact on the economic activities of the civil engineering industry. The technology drivers/pillars of IR4.0 that are relevant by these technology drivers/pillar of IR4.0 is shown in Table 4.38.

Table 4.38: Table of Technology Drivers/Pillars Relevant to IR4.0

No.	Technology Drivers / Pillars	Civil Engineering Job Area	
		Yes [%]	No [%]
1.	Autonomous Robots (Coordinated and automated actions of robots to complete tasks intelligently, with minimal human input)	90	10
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)	93.3	6.7
3.	Cloud Computing (Storing and accessing data and programs over the Internet instead of your computer's hard drive)	91.1	8.9
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)	85.6	14.4
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)	84.4	15.6
6.	System Integration	92.2	7.8

	(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)	92.2	7.8
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)	85.6	14.4
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)	94.4	5.6

4.4 Mapping OS to Available NOSS

This section provides a mapping of OS with available NOSS. A total of 23 available NOSS are identified, and mapping over with the occupational structure produced based on NOSS Registry updated 24th June 2021. The remaining 7 NOSS are not mapped in the OS due to the JT are not compatible/appropriate with the present JT gathered in this study is presented in Table 4.39, 4.40, 4.41 and 4.42.

Table 4.39: Mapping OS to Available NOSS of Road and Railways (1 of 2)

SECTION	(F) CONSTRUCTION		
DIVISION	(42) CIVIL ENGINEERING		
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS		
AREA	Road Work	Traffic Management (Signalling)	Traffic Management (Shadow Traffic)
LEVEL 8	No Job Title	No Job Title	No Job Title
LEVEL 7	Project Manager	No Job Title	No Job Title
LEVEL 6	Construction Manager	Traffic Manager	Traffic Manager
LEVEL 5	Site Engineer	F421-001-5:2020 Construction Traffic Management Officer (CTMO) (03-09-2020)	F421-001-5:2020 Construction Traffic Management Officer (CTMO) (03-09-2020)
LEVEL 4	Road Construction Senior Supervisor	Traffic Supervisor	F421-001-4:2020 Permanent Way Administration (03-09-2020)
LEVEL 3	BC-063-3:2015 <i>Road Construction & Maintenance Supervision</i> (31-03-2015)	Traffic Controller	TP-700-3:2014 Permanent Way Supervision (10-12-10)(25-09-2014)
LEVEL 2	BC-063-2:2015 <i>Road Construction Operation</i> (31-03-2015)	Flagman	TP-700-2:2014 Permanent Way Inspection (10-12-10)(25-09-2014)
LEVEL 1	General Workers	General Workers	General Workers

Table 4.40: Mapping OS to Available NOSS of Road and Railways (2 of 2)

SECTION	(F) CONSTRUCTION	
DIVISION	(42) CIVIL ENGINEERING	
GROUP	(421) CONSTRUCTION OF ROAD AND RAILWAYS	
AREA	Grouting	Tunnel Lining (Segment)
LEVEL 8	No Job Title	Project Director
LEVEL 7	No Job Title	General Manager
LEVEL 6	No Job Title	Construction Manager
LEVEL 5	No Job Title	Segment Engineer
LEVEL 4	No Job Title	Senior Material Coordinator
LEVEL 3	BC-048-3 <i>Grouting Supervisor</i> (24-04-2013)	BC-049-3 <i>Supervisor</i> (24-04-2013)
LEVEL 2	BC-048-2 <i>Grouting Foreman</i> (24-04-2013)	BC-049-2 <i>Tunnel Technician</i> (24-04-2013)
LEVEL 1	BC-048-1 <i>Grouter</i> (24-04-2013)	BC-049-1 <i>Assistant Tunnel Technician</i> (24-04-2013)

Table 4.41: Mapping OS to Available NOSS of Utility Projects (1 of 2)

SECTION	(F) CONSTRUCTION	
DIVISION	(42) CIVIL ENGINEERING	
GROUP	(422) CONSTRUCTION OF UTILITY PROJECTS	
AREA	Pipeline (Cutting / Joining)	Pipeline (Jacking)
LEVEL 8	No Job Title	No Job Title
LEVEL 7	No Job Title	No Job Title
LEVEL 6	Construction Manager	Construction Manager
LEVEL 5	Site Engineer	Site Engineer
LEVEL 4	Pipeline Coordinator	Pipe Work Coordinator
LEVEL 3	BC-052-3 / FHG3 Pipeline Supervisor (25-10-10)	F422-002-3:2020 Pipe Jacking Operator (13-11-2020)
LEVEL 2	BC-052-2/ FHG2 Pipeline Fitter II (25-10-10)	F422-002-2:2020 Assistant Pipe Jacking Operator (13-11-2020)
LEVEL 1	BC-052-1/ FHG1 Pipeline Fitter I (25-10-10)	General Workers

Table 4.42: Mapping OS to Available NOSS of Utility Projects (2 of 2)

SECTION	(F) CONSTRUCTION	
DIVISION	(42) CIVIL ENGINEERING	
GROUP	(422) CONSTRUCTION OF UTILITY PROJECTS	
AREA	Drainage	Domestic Sewerage System
LEVEL 8	No Job Title	Project Director
LEVEL 7	No Job Title	Project Manager
LEVEL 6	Construction Manager	Construction Manager
LEVEL 5	Site Engineer	Site Engineer
LEVEL 4	Drainage Coordinator	Coordinator
LEVEL 3	Drainage Supervisor	SWC3 Sewerage Civil and Structure Supervisor (26-05-2008)
LEVEL 2	F422-004-2:2021 <i>Senior Drain Layer</i> (24-06-2021)	SWC2 Sewerage C & S Fitter (26-05-2008)
LEVEL 1	F422-004-1:2021 <i>Drain Layer</i> (24-06-2021)	SWC1 Sewerage C & S Installer (26-05-2008)

4.5 Conclusion

Based on the discussion among industries experts and data gathered from the survey, OF for the civil engineering industry is developed. The OF provides information on the competency and job areas applicable to the civil engineering industry and the skill level of different JT, based on the MOSQF Level Descriptors.

CHAPTER 5

DISCUSSION, RECOMMENDATIONS AND CONCLUSION

5.1 Discussion

Based on findings gathered from the occupational analysis on the civil engineering industry, 42 job areas have been identified and confirmed to be in tandem with MSIC2008. 223 job titles are listed, of which 49 of them are classified as critical job titles, and 101 job titles are identified as job titles related to IR4.0.

This study provides a relatively complete view of the industry needs in terms of skills development and thus is able to assist in strategising the NOSS development for the critical job areas.

5.2 Recommendations

Based on the findings, specific recommendations are listed obtained from a survey administered to 270 respondents. This study divides related concerns in the Civil Engineering Industry into four Likert scales: (1) Strongly Disagree (SD), (2) Disagree (D), (3) Agree (A), and (4) Strongly Agree (A) (SA).

High reliance on foreign labour is deemed to be one of the most pressing challenges today, accounting for 68 per cent of the total. As seen in Figure 5.1, and health and safety (66 per cent) are all factors to consider. Table 5.1 shows the details of related issues in the civil engineering Industry.

Table 5.1: Table of Related Issues in Civil Engineering Industry

No.	KEY ISSUES	Scale			
		SD [%]	D [%]	A [%]	SA [%]
1.	Insufficient manpower	1.1	7.8	43.3	47.8

2.	Health and safety	0	5.6	28.9	65.6
3.	Technological change	0	3.3	40.0	56.7
4.	Low skilled and low-performance workforce	0	16.7	36.7	46.7
5.	Government policy/regulation	1.1	5.6	47.8	45.6
6.	Climatic problems	1.1	22.2	51.1	25.6
7.	Lack of training opportunities	0	5.6	47.8	46.7
8.	High dependency on foreign labour (low-skilled and semi-skilled level)	0	4.4	27.8	67.8
9.	High turnover (low wages, lack of career path, unattractive staff benefit, etc.)	0	3.3	33.3	63.3
10.	Lack of career exposure	0	5.6	37.8	56.7
11.	Economics condition	0	3.3	30.0	66.7
12.	The reduction of soil erosion.	5.6	15.6	46.7	32.2
13.	Reducing traffic congestion.	3.3	12.2	48.9	35.6
14.	Political influence	2.2	8.9	26.7	62.2
15.	Labour cost	1.1	3.3	30.0	65.6

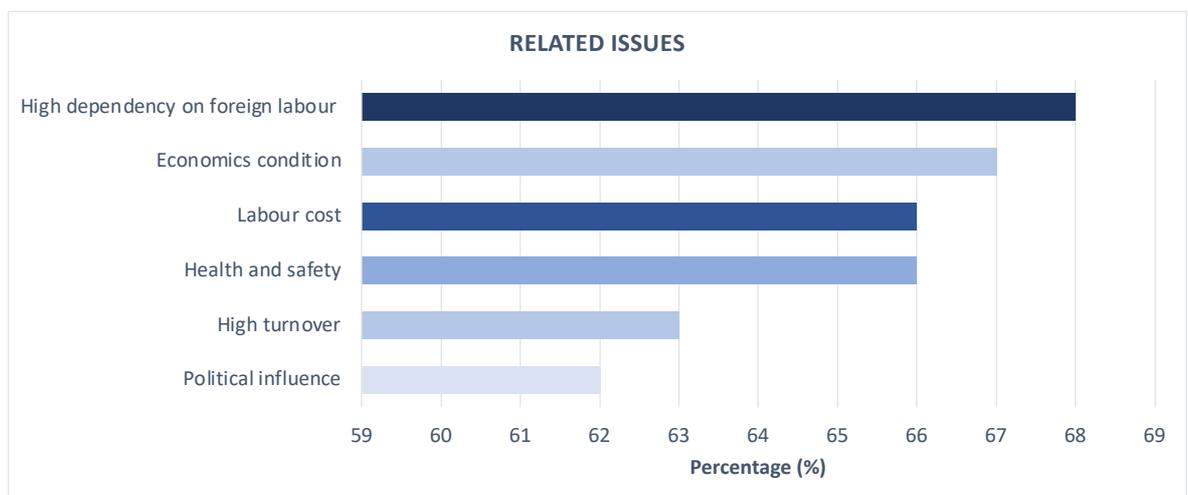


Figure 5.1: Related Issues in Civil Engineering Industry

5.3 Conclusion

In summary, the planned OF Division 42 for civil engineering is equivalent to the present MOSQF Level 1 – 8 category. The value of a training centre in strengthening Regulatory Bodies' relevance with government agencies is critical in identifying CiD. As a result, training centres are a crucial part in certifying JT at various levels. The conclusion is based on the OF's stated objectives, which are outlined below:

Objective 1: To develop the OS for MSIC 2008, Section F Division 42: Civil Engineering.

As a result of the OS analysed from the FGD conducted with industries panel experts from various experiences and organisations, a total number of 223 Identified Job Title is encountered, 49 Critical Job Title is met, and 101 Job Title Relevant to IR4.0 and Green Technology is identified.

Objective 2: To list the critical jobs in the civil engineering industry.

The Critical Jobs in the civil engineering industry are bar Road Painter Supervisor and Machine Operator, Construction Traffic Management Officer (CTMO), Noise Barrier Supervisor and Installer, bender, carpenter, welder, fitter, concreter, tunnel crew, flagman, rigger, TBM Mechanic and operator, Assistant Tunnel Technician and Tunnel Technician, Plant Coordinator and Hoisting Supervisor, Shift Boss, ERT Foreman and ERT Crew, pre & post-tensioned crew, beam launcher operation, bearing installer, joint expansion installation, noise barrier installer, bricklayer, and many more.

Objective 3: To develop the OD for each JT based on the latest industry OF.

One of the most important factors to consider while making career options is the occupational description. A compilation of facts concerning occupational and educational prospects is referred to as an occupational description. If a person wants to choose options that meet their responsibilities, knowledge, abilities, and traits as a civil

engineering employee, they must first gather and use occupational descriptions. The source from which the information can be received is an important part of the occupational description. Document analysis, computerised information obtained via the internet, and off-screen developer panel experts are all important sources of occupational description.

Objective 4: To determine the CiD in the civil engineering industry.

It was decided that all skilled work levels in civil engineering construction should have comprehensive capabilities; this is a determinant of a construction personnel's success. To ensure that civil engineering construction professionals are professionally suited for the construction business, they should have both hard (technical) and soft (behavioural) competencies. It's a must because they're at the vanguard of their field, where a lot of duties are on the line in today's fast-paced construction environment.

Problem solving and technical knowledge are two highly in-demand competencies in civil engineering construction and are classified under hard skills or knowledge. Then followed by soft skills or behaviours and led by communication, integrity and leadership.

Objective 5: To identify JT relevant to IR4.0 and green technology in the civil engineering industry.

A concerted effort to develop a strong, skilled worker base to gradually reduce reliance on low-skilled workers is one of the challenges affecting productivity for all sectors in Malaysia stated in MPC's 25th Productivity Report discussed in Chapter 2.

In the civil engineering construction sector, the need for low-skill workers is inevitable. The major challenges of the application of IR4.0 in the civil engineering sector are indeed acknowledged. However, in the discussion of FGD and the results of the survey

showed, the community of this sector acknowledged the need to IR4.0 in the application of its pillars needed in increasing the work productivity of the civil engineering sector.

Even though one of the five strategic thrusts established by the government is to increase the number of high-skilled workers in Malaysia's workforce while also restricting admission for low-skilled individuals in order to fulfil the expectations of the future economy, the nature of work in this field does require workers in this level (Level 1) which is usually known as a general worker or helper. The requirements for this job title normally do not require a level of competency except for the green card requirements as outlined by the CIDB. With the presence of those who are in this level which is usually among the less educated foreign workers, it is difficult for the application of IR4.0 in the nature of their work and their productivity is guided by good physical level, weather and supervision status. The strategic application of IR4.0 and green technology for mid-skilled and high-skilled worker jobs are agreed upon.

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ANNEX 1: MOSQF LEVEL DESCRIPTORS

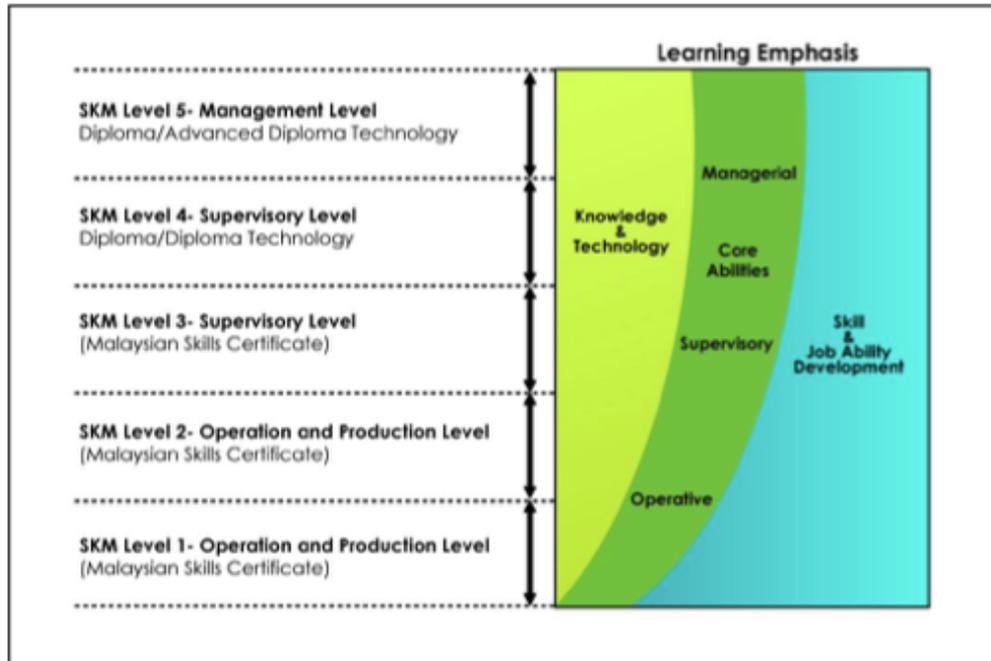
Malaysian Occupational Skills Qualification Framework (MOSQF) Level Descriptor

(Source: Department of Skills Development)

Level	Level Descriptors
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.

Level	Level Descriptors
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 understanding 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.

THE MALAYSIAN OCCUPATIONAL SKILLS QUALIFICATION FRAMEWORK (MOSQF)



ANNEX 2: LIST OF CONTRIBUTORS**LIST OF OCCUPATIONAL FRAMEWORK DEVELOPMENT COMMITTEE
FOR OF42: CIVIL ENGINEERING**

NO.	NAME	POSITION	ORGANISATION
1.	Ahmad Sarbiny bin Abd Rahman	Assistant Manager QA/QC	Gamuda Engineering Sdn. Bhd
2.	Ir. Mohd Pauzi bin Mohamed Tahir	Senior Manager	Senai-Desaru Expressway Sdn. Bhd
3.	Nurhana binti Abd Wahab	Project Manager	Ambangan Engineering Sdn. Bhd
4.	Ir. Sharruddin bin Long	General manager	ISL Integrated Sdn. Bhd.
5.	Thong Koon Choon	Project Advisor	Leika Sdn. Bhd.
6.	Ir. Redzuan bin Ab Rahman	Project Manager	Ekovest MRCB Construction Sdn. Bhd.
7.	Awi bin Shahadan	General manager	Binaan Desjaya Sdn. Bhd.
8.	Ridzuan bin Zainal Abidin	Project Engineer	Aecom Perunding Sdn. Bhd.
9.	Syed Muhammad Nazir bin Syed Othman	Manager (Special Officer)	CIDB
10.	Ts. Jeffryl Azniel bin Adzar	District engineer	Jabatan Kerja Raya
11.	Noor Azidy bin Ishak	Director	Worldsign Consulting Sdn. Bhd.
12.	Ir. Mohamed Yusrey bin Mahat	Assistant Director	Jabatan Kerja Raya
13.	Muhammad Fariq bin Abdul Hamid	Manager	CIDB

**LIST OF OCCUPATIONAL FRAMEWORK TECHNICAL EVALUATION
COMMITTEE FOR OF42: CIVIL ENGINEERING**

NO.	NAME	POSITION	ORGANISATION
1.	Sulaiha binti Ali	Chair	TVET Curriculum Division, DSD
2.	Khadijah binti Isaak	Committee	NOSS Division, DSD
3.	Noor Azura binti Adnan	Committee	NOSS Division, DSD
4.	Norhadawati binti Daud	Committee	NOSS Division, DSD
5.	Nazrul Hilmi bin Mohammad	Committee	NOSS Division, DSD
6.	Ir. Janari Bin Sekeli	Panelist	JKR
7.	Ir. Ali Bin Mohamad Yusof	Panelist	JKR
8.	Ibrahim bin Mohd Yusoff	Panelist	CIDB
9.	Annis bin Othman	Panelist	CIDB
10.	Noor Azhuril Bin Adnan	Panelist	Central Spectrum Pulau Indah

**LIST OF DEPARTMENTS OF SKILLS DEVELOPMENT (DSD) OFFICERS
INVOLVED IN OCCUPATIONAL FRAMEWORK DEVELOPMENT FOR
OF42: CIVIL ENGINEERING**

NO.	NAME	POSITION	ORGANISATION
1.	Dr. Hj. Ghalip bin Spahat	Director	NOSS Division, DSD
2.	Dr. Zool Hilmi bin Mohamed Ashari	Deputy Director	NOSS Division, DSD
3.	Khadijah binti Isaak	Chief Assistant Director	NOSS Division, DSD
4.	Noor Azura binti Adnan	Chief Assistant Director	NOSS Division, DSD
5.	Nazrul Hilmi bin Mohammad	Assistant Director	NOSS Division, DSD
6.	Norhadawati binti Daud	Skills Development Officer	NOSS Division, DSD

**LIST OF WORKFORCE TEAM IN OCCUPATIONAL FRAMEWORK
DEVELOPMENT FOR OF42: CIVIL ENGINEERING**

NO.	NAME	POSITION	ORGANISATION
1.	Ts. Dr. Zulhasni bin Abdul Rahim	Project Director	UTSB
2.	Dr. Muhamad Roslan bin Muhamad Yusoff	Project Manager	UTSB
3.	Ts. Dr. Mohd Zamri bin Ramli	Researcher, Head	Universiti Teknologi Malaysia
4.	Assoc. Prof. Ts. Dr. Asnul Dahar bin Minghat	Researcher, Assistant	Universiti Teknologi Malaysia Kuala Lumpur
5.	Dr. Siti Salina binti Mustakim	Writer/Proof-reader	Universiti Putra Malaysia

ANNEX 3: PARTICIPANT'S INFORMATION SHEET

Please read the following information carefully and do not hesitate to discuss any questions you may have with the researchers.

Research Title:

The Development of Occupational Framework (Civil Engineering)

General Objective:

To develop a standard development and co-curriculum for the TVET ecosystem by prioritizing emerging related technologies in the production of the occupational framework.

Specific Objectives:

Specifically, the study seeks to:

1. develop the OS for MSIC 2008, Section F Division 42: Civil Engineering.
2. list the critical jobs in civil engineering industry.
3. develop the OD for each JT based on the latest industry OF.
4. determine the CiD in civil engineering industry; and
5. identify JT relevant to IR4.0 and green technology in civil engineering industry.

Benefit and Risks:

You may not benefit directly from this research. For the purpose of confidentiality, your real name will not be disclosed in any of the transcripts, thesis and any publications related to this thesis except at your own request. All the records will be kept in a safe place and only accessible to the researcher. Your answers are still considered confidential, and name will not be displayed in the written report.

Inquiry:

If you have any inquiries pertaining to this research, you can contact (1) Ts. Dr. Mohd Zamri Ramli at 012-7139790 or email mohdzamri@utm.my, or (2) Ts. Dr. Asnul Dahar Minghat at 013-7280015 or email asnul@utm.my.

ANNEX 4: PARTICIPANT'S INFORMED CONSENT FORM

I Identity Card No.
 address.....

..... hereby voluntarily
 agree to take part in the research stated above *(video recording/focus group/interview-
 based/questionnaire-based).

I have been informed about the nature of the research in terms of methodology, possible
 adverse effects, and complications (as written in the Respondent's Information Sheet).

I understand that I have the right to withdraw from this research at any time without
 giving any reason whatsoever. I also understand that this study is confidential, and all
 information provided about my identity will remain private and confidential.

I* wish / do not wish to know the results related to my participation in the research

I agree/do not agree that the images/photos/video recordings/voice recordings related
 to me be used in any form of publication or presentation (if applicable).

* delete where necessary

Date: Signature:

(Respondent)

I confirm that I have explained to the respondent's the nature and purpose of the above-
 mentioned research.

Date: Signature:

(Researcher)

ANNEX 5: PARTICIPANTS SIGNED INFORMED CONSENT FORM



PARTICIPANT'S CONSENT FORM

I ...Ir. Redzuan bin Ab Rahman..... Identity Card No. ...620306085703.....
 address...62 Jalan Selasih 3, Taman Saujana Utama 3, 47000 Sungai Buloh Selangor.... hereby
 voluntarily agree to take part in the research stated above *(video recording/focus
 group/interview-based/questionnaire-based).

I have been informed about the nature of the research in terms of methodology, possible adverse effects and complications (as written in the Respondent's Information Sheet). I understand that I have the right to withdraw from this research at any time without giving any reason whatsoever. I also understand that this study is confidential, and all information provided about my identity will remain private and confidential.

I* wish /~~do not wish~~ to know the results related to my participation in the research

I agree/~~do not agree~~ that the images/photos/video recordings/voice recordings related to me be used in any form of publication or presentation (if applicable).

* delete where necessary

Date:26 October 2021....

Signature:
 (Respondent)



PARTICIPANT'S CONSENT FORM

I SHARRUDDIN B. WONG Identity Card No. 750628015877
 address NO 4 JLN 9/6C 40100 SHAH ALAM SELANGOR

..... hereby voluntarily agree to take part in the research
 stated above *(video recording/focus group/interview-based/questionnaire-based).

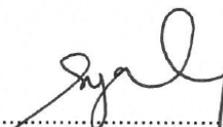
I have been informed about the nature of the research in terms of methodology, possible adverse effects and complications (as written in the Respondent's Information Sheet). I understand that I have the right to withdraw from this research at any time without giving any reason whatsoever. I also understand that this study is confidential, and all information provided about my identity will remain private and confidential.

I* wish / do not wish to know the results related to my participation in the research

I agree/do not agree that the images/photos/video recordings/voice recordings related to me be used in any form of publication or presentation (if applicable).

* delete where necessary

Date: 6/08/2021

Signature: 
 (Respondent)



JABATAN
PEMBANGUNAN
KEMAHIRAN (JPK)
KEMENTERIAN
SUMBER MANUSIA

PARTICIPANT'S CONSENT FORM

I, Ir Ts Jeffryl Azniel bin Adzar Identity Card No. 760417085655
address... 53 Persiaran Desa Tambun 7, Puncak Tambun Indah, 31400 Ipoh Perak
..... hereby voluntarily agree to take part in the research
stated above *(video recording/focus group/interview-based/questionnaire-based).

I have been informed about the nature of the research in terms of methodology, possible adverse effects and complications (as written in the Respondent's Information Sheet). I understand that I have the right to withdraw from this research at any time without giving any reason whatsoever. I also understand that this study is confidential, and all information provided about my identity will remain private and confidential.

I* wish / do not wish to know the results related to my participation in the research

I agree/do not agree that the images/photos/video recordings/voice recordings related to me be used in any form of publication or presentation (if applicable).

* delete where necessary

Date: 26-10-2021

Signature: 
(Respondent)



JABATAN
PEMBANGUNAN
KEMAHIRAN (JPK)
**KEMENTERIAN
SUMBER MANUSIA**

PARTICIPANT'S CONSENT FORM

I Ahmad Sarbiny Bin Abd.Rahman, Identity Card No. : 760302-11-5199 address No.24, Jalan P11 A1/12, Presint 11, 62300 Putrajaya hereby voluntarily agree to take part in the research stated above *(~~video recording/focus group/interview-based/questionnaire-based~~).

I have been informed about the nature of the research in terms of methodology, possible adverse effects and complications (as written in the Respondent's Information Sheet). I understand that I have the right to withdraw from this research at any time without giving any reason whatsoever. I also understand that this study is confidential, and all information provided about my identity will remain private and confidential.

I* wish ~~to~~ ~~wish~~ to know the results related to my participation in the research

I agree/~~do not agree~~ that the images/photos/video recordings/voice recordings related to me be used in any form of publication or presentation (if applicable).

* delete where necessary

Date: 6th August 2021

Signature: Ahmad Sarbiny.....
(Respondent)



JABATAN
PEMBANGUNAN
KEMAHIRAN (JPK)
KEMENTERIAN
SUMBER MANUSIA

PARTICIPANT'S CONSENT FORM

I, Ir Hj Noor Azldy Bln Ishak Identity Card No. 761217-12-5063
address. 5, Jalan P.11F/13, Presint 11, 62300 Putrajaya
..... hereby voluntarily agree to take part in the research
stated above *(video recording/focus group/interview-based/questionnaire-based).

I have been informed about the nature of the research in terms of methodology, possible adverse effects and complications (as written in the Respondent's Information Sheet). I understand that I have the right to withdraw from this research at any time without giving any reason whatsoever. I also understand that this study is confidential, and all information provided about my identity will remain private and confidential.

I* wish / ~~do not wish~~ to know the results related to my participation in the research

I agree/~~do not agree~~ that the images/photos/video recordings/voice recordings related to me be used in any form of publication or presentation (if applicable).

* delete where necessary

Date: 05 August 2021

Signature: 
(Respondent)



JABATAN
PEMBANGUNAN
KEMAHIRAN (JPK)
KEMENTERIAN
SUMBER MANUSIA

PARTICIPANT'S CONSENT FORM

I, Nurhara bt Abel Wahab Identity Card No. 800520-03-5006
 address 617, Block A Damansara Intan 552027 47400 PJ Selangor
Paul Ehsan hereby voluntarily agree to take part in the research
 stated above *(video recording/focus group/interview-based/questionnaire-based).

I have been informed about the nature of the research in terms of methodology, possible adverse effects and complications (as written in the Respondent's Information Sheet). I understand that I have the right to withdraw from this research at any time without giving any reason whatsoever. I also understand that this study is confidential, and all information provided about my identity will remain private and confidential.

I * wish / do not wish to know the results related to my participation in the research

I agree/do not agree that the images/photos/video recordings/voice recordings related to me be used in any form of publication or presentation (if applicable).

* delete where necessary

Date: 6/8/2021

Signature: 
 (Respondent)



PARTICIPANT'S CONSENT FORM

I, Thong Koon Chan Identity Card No. 550219-06-5105
 address 45 Jalan Kenanga SD9/8, Sri Damansara, 52200
Kuala Lumpur hereby voluntarily agree to take part in the research
 stated above *(video recording/focus group/interview-based/questionnaire-based).

I have been informed about the nature of the research in terms of methodology, possible adverse effects and complications (as written in the Respondent's Information Sheet). I understand that I have the right to withdraw from this research at any time without giving any reason whatsoever. I also understand that this study is confidential, and all information provided about my identity will remain private and confidential.

I ~~wish~~ / ~~do not wish~~ to know the results related to my participation in the research

I agree/~~do not agree~~ that the images/photos/video recordings/voice recordings related to me be used in any form of publication or presentation (if applicable).

* delete where necessary

Date: 6/8/21

Signature: [Signature]
 (Respondent)



JABATAN
PEMBANGUNAN
KEMAHIRAN (JPK)
KEMENTERIAN
SUMBER MANUSIA

PARTICIPANT'S CONSENT FORM

I AWI BIN SHAHADAN Identity Card No. 620330-01-5203
address A6462, TAMAN MAKMUR, LORONG ALOR AKARTI, JLN TG MUHAMAD,
KUANTAN, PAHANG hereby voluntarily agree to take part in the research
stated above *(video recording/focus group/interview-based/questionnaire-based).

I have been informed about the nature of the research in terms of methodology, possible adverse effects and complications (as written in the Respondent's Information Sheet). I understand that I have the right to withdraw from this research at any time without giving any reason whatsoever. I also understand that this study is confidential, and all information provided about my identity will remain private and confidential.

I* wish / do not wish to know the results related to my participation in the research

I agree/do not agree that the images/photos/video recordings/voice recordings related to me be used in any form of publication or presentation (if applicable).

* delete where necessary

Date: 27/10/2021

Signature: 
(Respondent)

ANNEX 6: FOCUS GROUP INTERVIEW PROTOCOLE

Research Title:

The Development of Occupational Framework (Civil Engineering)

Introduction:

Thank you for agreeing to be involved in this interview. This interview contains two sections. Section A deals with a demographic profile of respondents, and Section B relates to your knowledge, competencies, skills, and experience pertaining to your specialties.

Section A

1. Can you tell me about yourself?
2. What is your position in your present organization?
3. How old are you?
4. Can I have your final education level before you proceed into your existing field now?
5. Can you tell me about your years of working experience?

Section B

1. What will the industry's Occupational Standard (OS) look like?
2. What will be the Occupational Descriptions (OD) for each job title?
3. How to determine the demand for industry skills?
4. How to determine the relevant job titles that are in line with Industrial Revolution 4.0?
5. How to determine the critical jobs for the industry?

ANNEX 7: QUESTIONNAIRE



JABATAN
PEMBANGUNAN
KEMAHIRAN (JPK)
KEMENTERIAN
SUMBER MANUSIA

QUESTIONNAIRE

Civil Engineering Occupational Framework Survey

Dear Sir / Madam,

Assalamualaikum w.b.t. and Selamat Sejahtera,

The Department of Skills Development (DSD), Ministry of Human Resources (MoHR) 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 descriptions will be summarized for the use of 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.

The questionnaire is presented into two parts:

- (1) Part A: Demographic Profile, and
- (2) Part B: (1) Competency in Demand, (2) Jobs in Demand, (3) Emerging Skills, (4) Green Technology, and (5) Related Issues.

This survey is used as field data to conduct a comprehensive analysis of the industry's Occupational Framework. The target group for this survey is the organization's representatives either from the Human Resources Department or personnel at management level.

We would like to extend our heartfelt gratitude for your cooperation in answering this survey. Any inquiries related to the survey, please do not hesitate to contact us at: (1) Ts. Dr Mohd Zamri Bin Ramli: mohdzamri@utm.my, or (2) Ts. Dr Asnul Dahar Bin Minghat: asnul@utm.my.

Thank you.

PART A: DEMOGRAPHIC PROFILE

AGE	20 - 30	
	31 - 40	
	41 above	
Gender	Male	
	Female	
Position in Organization	Managing Director	
	Project Director	
	Project Manager	
	Construction Manager	
	Site Engineer	
	Others, please specify	
Types of Organization	Government Sector	
	Private Sector	
	Others	

PART B (1): COMPETENCY IN DEMAND

Listed below are sets of Competency in Demand related to personnel who are involved in the Civil Engineering. You are advised to refer to the Job Areas and Category of Skills pertaining to levels of demands provided in the scale.

Category of Skills	Job Areas
Not in demand (ND)	Job seekers have a lesser of skills / job seekers have a lesser probability of finding work within an occupation.
Low in demand (LD)	Job seekers are less likely of skills / job seekers are less likely to find employment in the job
Mid in demand (MD)	Job seekers have an uncertain of skills / job seekers have an uncertain probability of finding work within an occupation.
High in demand (HD)	Job seekers have a greater of skills / job seekers have a greater probability of finding work within an occupation.

Please rate the level of demand to set of skills by using the scale below.

1	2	3	4
Not in Demand	Low in Demand	Mid in Demand	High in Demand

No.	Competency	Rating Score
1.	Technical knowledge and skills.	
2.	Communication skills.	
3.	Leadership skills.	

4.	Administrative and managerial skills.	
5.	Analytical skills.	
6.	Diagnostic and troubleshooting skills.	
7.	Problem solving skills.	
8.	Product knowledge.	
9.	Quality assurance and quality control knowledge.	
10.	Computer literacy.	
11.	Construction method knowledge.	
12.	Knowledge of other tools and devices.	
13.	Integrity.	
14.	Strong technical aptitude / manual.	
15.	Planning and forecasting abilities.	
16.	General attitude towards work (commitment, resourcefulness, teamwork, etc.).	

PART B (2): JOBS IN DEMAND

Listed below are job areas and descriptions of the categories of skills. Based on your observation, which job area in experiencing shortage and demand of manpower in the Civil Engineering Industry is needed? Please tick (/) where applicable.

Category of Skills	Description
Skilled Workers	Managers, Executives, Specialists and Professionals
Semi-Skilled Workers	Support, Technicians, Administration and Machine Operators
Low-Skilled Workers	General Workers

No.	Job Areas and Category of Skills	High in Demand	Mid in Demand	Low in Demand	Not in Demand
Construction of Road and Railways					
1.	Road Work (Road Base)				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
2.	Premix				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
3.	Road Furniture				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
4.	Road Line Marking				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
5.	Traffic Management				
	a) Skilled Workers				
	b) Semi-skilled Workers				

	c) Low-skilled Workers				
6.	Retaining Wall				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
7.	Slope Protection				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
8.	Installation (Steelwork)				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
9.	Cutting / Welding (Steelwork)				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
10.	Grouting				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
11.	Tunnel Lining				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
12.	Tunnel Boring				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
13.	Tunneling Safety				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
14.	Tunneling Plant & Workshop				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
15.	Bridge Structure				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
16.	Drainage System				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
17.	Beam Launching				
	a) Skilled Workers				
	b) Semi-skilled Workers				

	c) Low-skilled Workers				
Construction of Utility Projects					
1.	Pipe Work				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
2.	Concrete Precast Panel				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
3.	Brick Manhole				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
4.	Traffic Management				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
5.	Drainage				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
6.	Telecommunication Tower				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
7.	Power Supply				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
8.	Water Supply				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
9.	Sewerage				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
Construction of Other Civil Engineering Projects					
1.	Port / Harbor / Marinas				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
2.	Airport / Runway				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
3.	Flood Mitigation System				

	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
4.	Dams / Dykes				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
5.	River Works				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				
6.	Sport Facilities				
	a) Skilled Workers				
	b) Semi-skilled Workers				
	c) Low-skilled Workers				

PART B (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.)

- Do you think Industry Revolution 4.0 (Digitalization) (IR4.0) would give an impact to the economic activities of the Civil Engineering?

Yes

No

Not Sure
- Listed below are the technology drivers / pillars of IR4.0. Which job area is likely to be affected by these technology drivers / pillars of IR4.0? Please tick (/) where applicable. You may tick more than one.

No.	Technology Drivers / Pillars	Civil Engineering Job Area
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)	

PART B (4): GREEN TECHNOLOGY

1. Do you think Green Technology would give an impact to the economic activities of the Civil Engineering?

Yes

No

[] Not Sure

2. Which job area is likely to be affected by these Green Technology? Please tick (/) where applicable. You may tick more than one.

No.	Green Technology	Civil Engineering Job Area
1.	Energy efficiency / renewable energy / minimization of energy (i.e: solar charging system)	
2.	Water efficiency (i.e: rain water harvesting)	
3.	Materials efficiency / recyclable & recycled products (i.e: reuse construction waste)	
4.	Waste reduction (i.e: reduce construction mistakes)	

PART B (5): RELATED ISSUES

1. What is/are the key issue/s related to the Civil Engineering? Please rate ALL key issues by using the scale below:

1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree

No.	KEY ISSUES	Scale			
		1	2	3	4
1.	Insufficient manpower				
2.	Health and safety				
3.	Technological change				
4.	Low skilled and low performance workforce				
5.	Government policy/regulation				
6.	Climatic problems				
7.	Lack of training opportunities				
8.	High dependency on foreign labour (low-skilled and semi-skilled level)				
9.	High turnover (low wages, lack of career path, unattractive staff benefit, etc)				
10.	Lack of career exposure				
11.	Economics condition				
12.	The reduction of soil erosion.				
13.	Reducing traffic congestion.				
14.	Political influence				
15.	Labour cost				

End of Questionnaire

ANNEX 8: INSTRUMENT VALIDATION FORM BY EXPERT PANEL



INSTRUMENT VALIDATION FORM

After reviewing and evaluating the instruments of this study, I hereby confirm that the instrument has fulfilled the requirement to carry out the study, taking into account the views and comments as in APPENDIX.

Thank you.

Name: Noor Nabilah Sarbini

Organization: Universiti Teknologi Malaysia

Official Stamp: IR. DR. NOOR NABILAH BINTI SARBINI
SENIOR LECTURER
Department of Structure and Materials
School of Civil Engineering
Faculty of Engineering
Universiti Teknologi Malaysia
81310 UTM Johor Bahru, Johor

Date: 15.9.2021



INSTRUMENT VALIDATION FORM

After reviewing and evaluating the instruments of this study, I hereby confirm that the instrument has fulfilled the requirement to carry out the study, taking into account the views and comments as in APPENDIX.

Thank you.

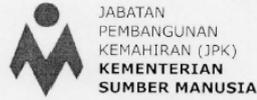
Name: Ts. Dr. Zulkifli Bin Mohd Sidi A.M.N.

Organization: Persatuan Penyelidik Latihan Kemahiran & Vokasional
(Association for Researcher of Skill & Vocational Training)

Official Stamp: _____

Date: 16 Sept. 2021





JABATAN
PEMBANGUNAN
KEMAHIRAN (JPK)
KEMENTERIAN
SUMBER MANUSIA

INSTRUMENT VALIDATION FORM

After reviewing and evaluating the instruments of this study, I hereby confirm that the instrument has fulfilled the requirement to carry out the study, taking into account the views and comments as in APPENDIX.

Thank you.

Name: Ts. Dr. SIVA A/L RABINDARANG

Organization: KOLEJ VOKASIONAL SLIM RIVER

Official Stamp: Ts. Dr. Siva a/l Rabindarang, PhD, P.Tech.
Ketua Jabatan Teknologi Awam
Kolej Vokasional Slim River

Date: 15 SEPTEMBER 2021



APPENDIX

COMMENTS AND REVIEW

(Please use additional pages if there is not enough space)

1. Not stated Part B (5); Related issues in instruction page (1st page).
2. Part A; Demographic profile - all the question are relevant dan suitable.
3. Part B(1); Competency in Demand - questions are relevant and suitable to current required competency. It's better to rearrange according soft skills and hard skills.
4. Part B(2) - Part B(4); Suitable questions and relevant in Civil Engineering Industry.
5. Part B(5): Related issues → Question 12 & 13 very technical and need some amendments.

Overall all the questions are relevant and suitable in Civil Engineering Industry.

Thank You.

ANNEX 9: OCCUPATIONAL DESCRIPTION

MSIC GROUP : 421
 AREA : **Road Line Marking**
 JOB TITTLE : Road Painter Supervisor
 LEVEL : 3

RESPONSIBILITIES:

Understands and effectively carries out oral and written instructions. Deals effectively with the public. Demonstrates independence of judgment and action in performing the duties of the position. Operates a centre line marking machine and other line marking equipment. Works from maps and drawings. Maintains records. Provides direction to staff. Considerable knowledge of equipment, methods, techniques, hand/power tools in line marking. Knowledge of standard road systems. Knowledge of types of paints, application techniques and necessary safety precautions. Knowledge of the design regulations of traffic lines, etc. Knowledge of road policies, procedures & standards. Knowledge of applicable safety regulations. Physical co-ordination necessary to carry out the duties of the position.

Knowledge:

- High School graduate with extensive working experience in Road Marking, Diploma/BSc degree is preferred

Skills:

- Leadership quality and interpersonal skill.
- Ability to work in tense and pressure environment.
- Problem solution skill.
- Excellent verbal and written communication skills.
- Computer literate with e-mail, word processing and spreadsheet.
- Ability to design database and prepare meaningful reports.

Attributes (Attitude/Safety/Environmental):

- Team oriented.

MSIC GROUP : 421
 AREA : **Road Line Marking**
 JOB TITLE : Machine Operator Road Painter
 LEVEL : 2

RESPONSIBILITIES:

Applies paint for new traffic lines and repaints existing traffic lines. Cleans out paint guns and valves. Lays out new markings according to drawings. Records information associated with the specific tasks carried out. Completes pre-trip inspection of the equipment as per procedures. Ensures that City, Provincial and National regulations are followed. Provides direction for those working with the equipment. Assists other crew members in performing their duties. Performs routine maintenance tasks. Keeps records. Drives a city vehicle to and from work sites. Responds to inquiries from the public. Performs other job related duties as assigned. Communicates effectively both orally and in writing. Understands and effectively carries out oral and written instructions. Deals tactfully and effectively with the public. Demonstrates independence of judgment and action in performing the duties of the position. Operates a centre line marking machine and other line marking equipment. Works from maps and drawings. Maintains records. Provides direction to staff.

Knowledge:

- High School graduate with extensive working experience in Road Marking, Diploma degree is preferred
- At least 5 years work experience in in Road Marking, preferably with international donor-funded projects, USAID, UN agencies or NGO's on relevant programs in Afghanistan.
- Considerable knowledge of equipment, methods, techniques, hand/power tools in line marking.
- Knowledge of road systems.
- Knowledge of types of paints, application techniques and necessary safety precautions.
- Knowledge of the design regulations of traffic lines, etc.
- Knowledge of applicable safety regulations.

Skills:

- Ability to work in tense and pressure environment.
- Problem solution skill.
- Fluency in English and Malay
- Excellent verbal and written communication skills.

Attributes (Attitude/Safety/Environmental):

- Physical coordination necessary to carry out the duties of the position.

MSIC GROUP : 421
AREA : **Noise Barrer**
JOB TITTLE : Noise Barrer Supervisor
LEVEL : 3

RESPONSIBILITIES:

Collaborates with a team to develop active, noise-cancelling equipment and materials such as headphones. Analyses noise control systems to determine effectiveness by measuring actual sound reduction. Reads and interprets technical drawings and blueprints. Reviews results, comparing data with designs and materials currently used. Estimates the cost of alternative designs or materials and compares feasibility of those alternatives. Performs other related duties as assigned.

Knowledge:

- Bachelor's degree in Acoustics, Electrical Engineering, or Mechanical Engineering required, master's degree in related field preferred.
- At least two years of related experience required.

Skills:

- Thorough understanding of acoustics including theory and current applications.
- Excellent verbal and written communication skills.
- Excellent organizational skills and attention to detail.
- Strong analytical and problem-solving skills.
- Proficient with Microsoft Office Suite or related software.

Attributes (Attitude/Safety/Environmental):

- Prolonged periods sitting at a desk and working on a computer.
- Must be able to lift-up to 15 pounds at times.

MSIC GROUP : 421
AREA : **Noise Barrer**
JOB TITTLE : Noise Barrer Installer
LEVEL : 2

RESPONSIBILITIES:

Set out position of noise barrier line and post holes and excavate to specifications. Install base section. Install uprights plumb and to alignment. Fit and fix rails, cladding or panels. Clear work area and recycle or dispose of materials in accordance with project environmental management plan. Store and stack unused materials. Clean, check, maintain and store plant, tools, and equipment

Knowledge:

- civil construction terminology
- material/characteristics for noise barriers
- plant/crane capabilities and limitations
- safe lifting techniques
- types, characteristics, and installation techniques of noise abatement systems
- site and equipment safety requirements
- site isolation and traffic control responsibilities and authorities project quality requirements
- JSA's/safe work method statement

Skills:

- apply legislative, organisation and site requirements and procedures for installing noise barriers
- interpret engineering drawings
- select and use plant, tools and materials safely
- organise work tasks

Attributes (Attitude/Safety/Environmental):

- Be physically fit
- Proactive in maintaining clean and safe work area
- Good communication
- Can work independently
- Very passionate with job

MSIC GROUP	: 421
AREA	: Traffic Management (Signalling)
JOB TITLE	: Construction Traffic Management Officer (CTMO)
LEVEL	: 5

RESPONSIBILITIES

To supervise daily traffic management works and coordinates with Safety Officers and subcontractors on the job site. To study traffic management drawings in order to perform works as per project specifications. To ensure that all work carried out on their projects are handled in accordance with the relative work instructions and project requirements. To carry out various inspections and traffic equipment audits at project sites from time to time. To coordinate with the Purchasing Unit in acquisition of traffic safety equipment required for project use. To transfer materials from the warehouse to the project site. To coordinate any traffic issues and traffic related public complaints at the project site, and carry out any rectification work, if any. To ensure arrangement of traffic equipment are implemented in accordance to approve shop drawings and project specifications. To ensure hand tools and equipment are handled properly and well maintained. To enforce safety requirements are adequate at the project site and take any necessary safety measures if required. To monitor, record and report progress on assignments daily. To coordinate the demobilization activities after the project is completed. To assist in implementing site activities, site procedures and site instructions. To monitor closely to achieve timely completion of every section of work. To liaise with the clerk of works and supervise the traffic controllers and direct workers to ensure the project progress is on schedule without hindrance. To manage traffic controllers and direct workers to optimize labour efficiency. To control traffic equipment wastage, theft and damages by workers, sub-contractors or public. To optimize the usage of all site machineries and tools. To implement all policies, activities, procedures, instructions as relevant and required by the quality system. To perform any other duties set by the company policy, management, or his direct superior, which does not include in the above-mentioned descriptions. To lead a team of road maintenance workers to maintain the existing premise road, drainage system and grass cutting.

Knowledge:

- Working knowledge of ISO 9001 standard and ISO 45001 standard in the construction industry
- Basic Safety Health Environment requirements
- Construction drawing

Skills:

- Ability to organize and coordinate site activities
- Ability to handle AutoCAD will be an added advantage
- Computer literate and familiar with MS Office Application Software

Attributes (Attitude/Safety/Environmental):

- Be physically fit
- Good interpersonal and communication skills
- Can work independently
- Very passionate with job

MSIC GROUP : 421
AREA : **Traffic Management (Signalling)**
JOB TITLE : Flagman
LEVEL : 2

RESPONSIBILITIES:

Help vehicles move safely in their work areas. Help the drivers and operators in avoiding hazards and accidents occurrence. Ensure safety of work on site. Controlling the operation of vehicles on site and ensure safe parking. Control the movement of excavator, tipper truck, grader, bulldozer, and other vehicles on site. Ensuring safe distance from rotating equipment and excavation edges by giving signals

Knowledge:

- This role has no formal education requirements beyond a high school diploma. However, a flagger must have certification, usually through the Traffic Safety Services Association, in order to work in this position. Most companies also have their own training programs for flaggers.

Skills:

- Mechanical skills – flaggers must know how to use electronic safety and traffic control devices
- Communication skills – when providing directions and safety instructions, verbal communication skills are critical. Familiarity with nonverbal communication methods such as hand signals, signs, and other devices is equally important
- Organization skills – setting up cones and maintaining traffic patterns around construction sites requires that flaggers possess strong organization skills
- Interpersonal skills – the ability to greet drivers and pedestrians with a friendly, outgoing manner and to interact with a diverse population is essential

Attributes (Attitude/Safety/Environmental):

- Physical fitness – in addition to standing for long periods, flaggers must be able to carry and lift equipment as needed
- Self-motivation – flaggers should be able to conduct traffic control with little to no supervision during the course of the day

MSIC GROUP	: 421
AREA	: Traffic Management (Shadow Traffic)
JOB TITLE	: Construction Traffic Management Officer (CTMO)
LEVEL	: 5

RESPONSIBILITIES

To supervise daily traffic management works and coordinates with Safety Officers and subcontractors on the job site. To study traffic management drawings in order to perform works as per project specifications. To ensure that all work carried out on their projects are handled in accordance with the relative work instructions and project requirements. To carry out various inspections and traffic equipment audits at project sites from time to time. To coordinate with the Purchasing Unit in acquisition of traffic safety equipment required for project use. To transfer materials from the warehouse to the project site. To coordinate any traffic issues and traffic related public complaints at the project site, and carry out any rectification work, if any. To ensure arrangement of traffic equipment are implemented in accordance to approve shop drawings and project specifications. To ensure hand tools and equipment are handled properly and well maintained. To enforce safety requirements are adequate at the project site and take any necessary safety measures if required. To monitor, record and report progress on assignments daily. To coordinate the demobilization activities after the project is completed. To assist in implementing site activities, site procedures and site instructions. To monitor closely to achieve timely completion of every section of work. To liaise with the clerk of works and supervise the traffic controllers and direct workers to ensure the project progress is on schedule without hindrance. To manage traffic controllers and direct workers to optimize labour efficiency. To control traffic equipment wastage, theft and damages by workers, sub-contractors or public. To optimize the usage of all site machineries and tools. To implement all policies, activities, procedures, instructions as relevant and required by the quality system. To perform any other duties set by the company policy, management, or his direct superior, which does not include in the above-mentioned descriptions. To lead a team of road maintenance workers to maintain the existing premise road, drainage system and grass cutting.

Knowledge:

- Working knowledge of ISO 9001 standard and ISO 45001 standard in the construction industry
- Basic Safety Health Environment requirements
- Construction drawing

Skills:

- Ability to organize and coordinate site activities
- Ability to handle Autocad will be an added advantage
- Computer literate and familiar with MS Office Application Software

Attributes (Attitude/Safety/Environmental):

- Be physically fit
- Good interpersonal and communication skills
- Can work independently
- Very passionate with job

MSIC GROUP : 421
AREA : **Drainage System (Reinforcement Work)**
JOB TITTLE : Road Drainage Bar Bender
LEVEL : 2

RESPONSIBILITIES:

A drainage system bar bender is responsible to request for reinforcement bar storage area, maintain and upkeep hand tools, reinforcement bar and bar bending machine, prepare bar bending work bench, prepare reinforcement spacer, perform bar cutting works, perform bar bending works, perform reinforcement tying, perform reinforcement placing, perform reinforcement spacer placing, perform housekeeping and perform work as per construction drawing and method statement.

Knowledge:

- Basic mathematics
- Material knowledge (types of rebar, BRC etc)
- Basic Safety Health Environment requirements
- Cutting, bending & assembling techniques
- Construction drawing
- Tools usage

Skills:

- Apply bending skills
- Apply assembling techniques
- Interpret construction drawing

Attributes (Attitude/Safety/Environmental):

- Be physically fit
- Proactive in maintaining clean and safe work area
- Good communication
- Can work independently
- Very passionate with job

MSIC GROUP : 421
AREA : **Road Drainage System (Concrete Works)**
JOB TITLE : Road Drainage Concreter
LEVEL : 2

RESPONSIBILITIES:

Preparation tasks include site clean-up, use of hand blowers and vacuums. A concreter is responsible to perform work as per construction drawing and method statement. Carry out concreting work, carry out loading and unloading of material and concreting work related to water proofing. Also, assist in carrying out sample testing and taking concrete samples for testing. Carry out concrete mixing, handle tools and equipment and perform routine maintenance.

Knowledge:

- Several years of industry-related experience apprenticeship
- At least a High School diploma or certification from a vocational school

Skills:

- Shovelling concrete
- Spreading concrete using vibrations and levels
- Manually screeding concrete by bending and using a hand screed
- Good communication and interpersonal skills which enable a concrete labourer to work closely with co-workers and contractors
- Strong precision skills, as a concrete labourer must be able to mix, pour, and spread concrete in the proper proportion
- Well-developed safety skills which enable him/her to take careful and mindful actions since construction sites pose a lot of danger

Attributes (Attitude/Safety/Environmental):

- Be physically fit for standing, kneeling, and crouching positions
- Ability to perform strenuous tasks with hands
- Ability to kneel, bend and lift heavy materials
- Ability to measure accurately and read specifications

MSIC GROUP : 421
 AREA : **Road Drainage System (Timber Work)**
 JOB TITLE : Road Drainage Carpenter
 LEVEL : 2

RESPONSIBILITIES:

Correctly interpret blueprints, specifications, and project plans to meet clients' needs. Responsible for the installation of structures and fixtures, including windows and moulding. Create a program/schedule for the use of materials and associated equipment for carpentry work. Provide support to concrete foreman with project layout and elevation shooting. Take the measurement and cut materials to build forms for pouring concrete. Responsible for operating electrical, air-powered, and regular hand tools during projects. Spread, rake, and finish concrete. Responsible for carrying out general construction labour tasks. Provide support with fabrication during projects. Carry out other duties as assigned.

Knowledge:

- High School diploma. High School courses in mathematics, mechanical drawing, and general vocational technical trainings are essential elements that employers seek in applicants
- Should have minimum of 2 years' experience in general carpentry, the ability to understand construction drawings and piece tickets, and expertise in concrete construction carpentry
- Familiar with commercial concrete pours and large-scale concrete forming projects; the ability to tie/tack rebar, set forms, and pour footers; also, familiarity with foundation work, vertical concrete work, and erecting scaffolding, and cam-lock system forms

Skills:

- Can read and understand blueprints, diagrams, and local and national building codes
- Math skills: They should have basic math skills necessary to take accurate measurement of materials needed to construct a form
- Organizational skills: Concrete form carpenters are responsible for planning the sequence of work from start to finish; therefore, applicants for the job must be organized to successfully carry out such tasks
- Detail-oriented: To be a successful form Carpenter, measurements must be précised; there should be little or no gaps between windows and frames to reduce the chances of leaks around the window, etc. Therefore, form carpenter should have good eyes for detail to guarantee that the work is level, plumb, and square

Attributes (Attitude/Safety/Environmental):

- Physical stamina and dexterity: Concrete form carpenters utilize various hand and power tools and must also maintain hand-eye coordination to avoid injury to self or damage to materials. So, it is important that they have manual dexterity, stamina, and strength to lift heavy materials as necessary. They should be able to lift 50 to 100 pounds without assistance.

MSIC GROUP : 421
 AREA : **Road Drainage System (Brick Work)**
 JOB TITLE : Road Drainage Bricklayer
 LEVEL : 2

RESPONSIBILITIES:

Laying bricks. Applying or removing mortar with a trowel. Working accurately from detailed plans and specifications. Sealing foundations with damp-resistant materials. Using spirit levels and plumb lines to check building alignment. Using hand tools, power tools and brick-cutting machines. Constructing arches and ornamental brickwork. Repairing and maintaining building blocks. Measuring out build areas and setting out the first rows of bricks and damp course. Working outdoors on construction sites, in all weathers and at height.

Knowledge:

- Minimum of 1 year industry-related experience on construction site
- At least a High School diploma or certification from a vocational school
- Knowledge of materials, methods and the tools involved in bricklaying and the construction of buildings

Skills:

- Problem-solving ability
- Ability to work independently or as part of a team
- Highly experienced in measuring distances from reference points and marking appropriate guidelines.
- Exceptionally talented in creating mortar using cement machines and spreading mortar on surfaces to serve as a bed and binder for blocks.
- Deep insight into breaking and shaping bricks to ensure that they fit in properly.
- Ability to perform dedicated activities to remove excess mortar from surfaces in a safe manner.
- Demonstrated expertise in fastening bricks to faces of structures using time wires.
- Hands-on experience in applying plaster to walls and ceilings as part of both repair and construction work.
- Proficient in clearing work areas before and after each project to ensure the safety of space for workers.
- Adept at taking measures to ensure that bricks are properly layered and aligned according to instructions and construction plans.
- Proven ability to use and maintain a wide variety of hand and power tools such as trowels and hammers.

Attributes (Attitude/Safety/Environmental):

- Be physically fit for kneeling for long periods
- Ability to lift 100 pounds

MSIC GROUP : 421
 AREA : **Cutting/ Welding (Steelwork)**
 JOB TITLE : Steelwork Welder
 LEVEL : 2

RESPONSIBILITIES:

Perform work as per construction drawing and method statement. Request for material storage area. Determine welding method and material. Prepare and clean surfaces and special part for welding purposes. Carry out cutting work. Select, position, and align parts of fixtures to be welded. Carry out welding works. Paint the joint part. Adhere to safety and security procedure. Follow Standard Operating Procedure. Weld small and large steel components. Use specialized machinery for industrial welding and oversee machines that perform the same job. Maintain and repair all machinery. Assess welded surfaces, structures, and components to identify errors. Follow and enforce strict safety regulations such as wearing heat-resistant gloves, protective masks, and safety shoes. Monitor machinery for appropriate usage and temperature. Weld components in flat, vertical, and overhead positions.

Knowledge:

- High school diploma or equivalent qualification.
- A valid certificate in welding from an accredited institution.
- A minimum of 2 years' experience as a welder.
- Excellent knowledge of welding machinery, electrical equipment, and manual tools.
- Ability to read and interpret blueprints and designs.
- Outstanding attention to detail.
- Knowledge of metallurgy
- Knowledge of various welding techniques, including TIG, MIG, arc, and oxy-fuel welding
- Knowledge of manual and mechanical welding techniques

Skills:

- Excellent communication skills, both verbal and written
- Ability to read blueprints
- Analytical skills
- Precision
- Mechanical
- Visualization
- Concentration

Attributes (Attitude/Safety/Environmental):

- Physical Endurance
- Depth Perception
- Close Vision
- Hand-eye Coordination
- Lifting Considerable Weight
- Manual Dexterity
- Steady Hands
- Working in Adverse Conditions

MSIC GROUP : 421
 AREA : **Retaining Wall**
 JOB TITLE : Retaining Wall Supervisor
 LEVEL : 3

RESPONSIBILITIES:

Assist in planning physical work activities in respective trade. Prepare daily work schedule. Assign work based on job tasks. Brief workers on work procedures. Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc) to determine work requirements. Coordinate work activities. Monitor usage of equipment on construction sites to verify safety and specification compliance. Carry out regular work inspections. Identify and request the required materials, manpower and machinery. Attend technical and site meetings. Compile site document or record to prepare report. Raise site safety concerns and identify construction hazards and risk. Report site matters to superior or management. Supervise subordinate work. Supervise compliance of safety, health, and environment requirements. Arrange for maintenance activities. Perform subordinate appraisal. Conduct training for construction methods, operation of machinery and equipment, site safety requirements. Troubleshoot and rectify within work scope. Prepare and compile reports for site activities including QA QC documents, SHE documents.

Knowledge:

- Professional Certificate, Diploma, Advanced/Higher/Graduate Diploma, Bachelor's Degree, Post Graduate Diploma, Professional Degree
- Knowledge of construction tools and equipment
- Completion of a post-secondary education construction training program.
- Bachelor's degree in construction management, construction science, civil engineering, or related field is preferred.
- Proven experience working as a site supervisor.
- CPR and first aid certifications.
- Sound knowledge of building codes and construction safety regulations.

Skills:

- Ability to interpret blueprints
- Outstanding leadership skills
- Strong analytical and problem-solving skills
- Excellent organizational and communication skills

Attributes (Attitude/Safety/Environmental):

- Ability to nurture effective professional relationships with staff and clients
- Strong project management abilities
- Confidence to thrive under pressure
- Professional demeanour and attitude

MSIC GROUP : 421
 AREA : **Tunnel Lining (Segment)**
 JOB TITLE : Supervisor
 LEVEL : 3

RESPONSIBILITIES:

Assist and support Engineers in carrying out works as assigned, and ensuring that the works are carried out to schedule and in accordance to relevant regulations. Manage and supervise site workers for each shift. Ensure completion of work in accordance to main contractor program and requirements safely with no accidents and incidents. Troubleshooting and submit in-house report. Monitored and keep a daily record of all activities at the construction site to ensure that all data is kept in a proper manner. Responsible for day to day project management, include liaison with all parties involved in the project. Performed any other duties and responsibilities required by superior.

Knowledge:

Have experience in supervision of temporary works and underground structure or tunnelling.

Possess at least Diploma in Engineering (Civil) or equivalent.

Possess Certificate in Construction Safety Supervisor

Skills:

- strong communication skills - for liaising with a range of clients, professionals, and workers on site
- leadership skills and an ability to motivate your team to ensure a high standard of work
- an awareness of health and safety procedures and legislation.
- sound commercial awareness - to allocate and manage your budget effectively and to understand client concerns
- Interacted with all level of people confidently.

Attributes (Attitude/Safety/Environmental):

- Ability to hear, speak, and understand the spoken English & Malay word.
- Ability to read and understand directions in English & Malay
- Ability to stand, work throughout the day.
- Ability to see and adjust focus at close distances.
- Able to do shift works

MSIC GROUP : 421
AREA : **Tunnel Lining (Segment)**
JOB TITTLE : Tunnel Technician
LEVEL : 2

RESPONSIBILITIES:

Tunnelling Technician could be required to work in a confined environment for long periods of time, as some tunnels are several kilometres long. Preparing the site for tunnelling work. Organising the delivery and storage of all the equipment. Ensuring the correct materials are available to start work. Moving and handling materials, resources and components by mechanically assisted or manual means. Loading and unloading, handling and conveying goods and materials. Gather and check equipment

Knowledge:

- Ability to read and interpret documents such as safety rules, operating and maintenance instructions, and procedure manuals.
- Ability to work outdoors and confined area.
- Typical work consists of 8 hours a day, 5 days per week, with weekend availability when the workload requires it.
- Confined Space Training

Skills:

- Strong work ethic
- Work schedule implementation. Prepare method statement
- Responsible for daily tunnelling works
- Overcome technical & tunnelling problems
- Join tunnel team to finish target rings safely each shift and hand over to next shift
- Ensure to follow out the safety procedures and in accordance with method statement

Attributes (Attitude/Safety/Environmental):

- Responsibility for the given job task
- Responsibility as a team members
- Good in interpersonal relationship and able to deal with others
- Must be willing and able to work overtime, including weekends and holidays when needed.
- Willing to travel and work under pressure

MSIC GROUP : 421
AREA : **Tunnel Lining (Segment)**
JOB TITLE : Assistant Tunnel Technician
LEVEL : 1

RESPONSIBILITIES:

Using computers with construction management software to help keep the work running smoothly. Preparing the site for tunnelling work. Organising the delivery and storage of all the equipment. Ensuring the correct materials are available to start work. Moving and handling materials, resources, and components by mechanically assisted or manual means. Loading and unloading, handling, and conveying goods and materials.

Knowledge:

- Several years of industry-related experience in tunnelling construction
- At least a High School diploma or certification from a vocational school

Skills:

- Great team working skills
- Good communication skills
- Awareness of health and safety measures

Attributes (Attitude/Safety/Environmental):

- Be physically fit for standing for long period
- comfortable working in enclosed spaces

MSIC GROUP : 421
 AREA : **Tunnel Lining (Crane)**
 JOB TITTLE : Plant Coordinator
 LEVEL : 3

RESPONSIBILITIES:

Assist and support Segment Engineers in carrying out works as assigned, and ensuring that the works are carried out to schedule and in accordance to relevant regulations. Manage and supervise crane workers for each shift. Ensure completion of work in accordance to main contractor program and requirements safely with no accidents and incidents. Troubleshooting and submit in-house report. Monitored and keep a daily record of all activities at the construction site to ensure that all data is kept in a proper manner. Responsible for day to day project management, include liaison with all parties involved in the project. Performed any other duties and responsibilities required by superior.

Knowledge:

Have experience in supervision of crane and underground structure or tunnelling.
 Possess at least Diploma in Engineering (Civil) or equivalent.
 Possess Certificate in Construction Safety Supervisor

Skills:

- strong communication skills - for liaising with a range of clients, professionals, and workers on site
- leadership skills and an ability to motivate your team to ensure a high standard of work
- an awareness of health and safety procedures and legislation.
- sound commercial awareness - to allocate and manage your budget effectively and to understand client concerns
- Interacted with all level of people confidently.

Attributes (Attitude/Safety/Environmental):

- Ability to hear, speak, and understand the spoken English & Malay word.
- Ability to read and understand directions in English & Malay
- Ability to stand, work throughout the day.
- Ability to see and adjust focus at close distances.
- Able to do shift works

MSIC GROUP : 421
AREA : **Tunnel Lining (Crane)**
JOB TITLE : Hoisting Supervisor
LEVEL : 2

RESPONSIBILITIES:

Working as part of a team to ensure lifting operations comply with the law and they secure the health and safety of employees and of all those affected by the operations; Co-ordinating and supervising all lifting activities in accordance with the Lifting Plan; Briefing all lifting team members; Being present during all lifting operations; Ensuring that ground conditions are safe for any operations involving mobile cranes; Taking suitable measures to rectify unsafe conditions; Ensuring only registered operators and appointed staff are involved in any lifting operation; In a full-time position, Crane Supervisors usually work between 35 and 40 hours per week; Working hours can be variable and overtime may be required in order to meet project deadlines

Knowledge:

- Level 2 Certificate in Construction Plant Operations
- Level 3 Diploma in Construction and Build Environment
- Experienced in construction industry projects for several years

Skills:

- Patience and ability to remain calm in stressful situations
- Knowledge of building and construction
- Good attention to detail
- Good communication skills
- Ability to use, repair and maintain machines and tools
- Ability to operate and control equipment.

Attributes (Attitude/Safety/Environmental):

- Fit to work for long hours
- Ability to work well with others

MSIC GROUP : 421
AREA : **Tunnel Lining (Crane)**
JOB TITTLE : Tunnel Crew
LEVEL : 1

RESPONSIBILITIES:

Using computers with construction management software to help keep the work running smoothly. Preparing the site for tunnelling work. Organising the delivery and storage of all the equipment. Ensuring the correct materials are available to start work. Moving and handling materials, resources, and components by mechanically assisted or manual means. Loading and unloading, handling, and conveying goods and materials.

Knowledge:

- Several years of industry-related experience in tunnelling construction
- At least a High School diploma or certification from a vocational school

Skills:

- Great team working skills
- Good communication skills
- Awareness of health and safety measures

Attributes (Attitude/Safety/Environmental):

- Be physically fit for standing for long period
- comfortable working in enclosed spaces

MSIC GROUP : 421
AREA : **Tunnel Boring**
JOB TITLE : TBM operator
LEVEL : 3

RESPONSIBILITIES:

Operate theodolite. Install tunnel segments. Tend to be a boring machine. Use safety equipment in construction. Drive tunnel boring machine. Transport construction supplies. Follow health and safety procedures in construction. React to events in time-critical environments. Work ergonomically. Prevent damage to utility infrastructure. Switch tunnel boring machine modes

Knowledge:

- mechanical systems
- mechanics
- tunnel boring machine console
- electricity
- machinery load capacity

Skills:

- coordinate drilling
- determine tunnel boring machine speed
- drive mobile heavy construction equipment
- keep heavy construction equipment in good condition
- keep personal administration
- monitor excavated material
- monitor tunnel boring machine supplies
- operate excavator
- set up temporary construction site infrastructure
- work in a construction team

Attributes (Attitude/Safety/Environmental):

- Realistic / Conventional
- Realistic / Enterprising
- Realistic / Investigative

MSIC GROUP : 421
AREA : **Tunnel Boring**
JOB TITTLE : Tunnel Crew
LEVEL : 1

RESPONSIBILITIES:

Using computers with construction management software to help keep the work running smoothly. Preparing the site for tunnelling work. Organising the delivery and storage of all the equipment. Ensuring the correct materials are available to start work. Moving and handling materials, resources, and components by mechanically assisted or manual means. Loading and unloading, handling, and conveying goods and materials.

Knowledge:

- Several years of industry-related experience in tunnelling construction
- At least a High School diploma or certification from a vocational school

Skills:

- Great team working skills
- Good communication skills
- Awareness of health and safety measures

Attributes (Attitude/Safety/Environmental):

- Be physically fit for standing for long period
- comfortable working in enclosed spaces

MSIC GROUP : 421
AREA : **Tunnelling Plant & Workshop**
JOB TITLE : Tunnel Crew
LEVEL : 1

RESPONSIBILITIES:

Using computers with construction management software to help keep the work running smoothly. Preparing the site for tunnelling work. Organising the delivery and storage of all the equipment. Ensuring the correct materials are available to start work. Moving and handling materials, resources, and components by mechanically assisted or manual means. Loading and unloading, handling, and conveying goods and materials.

Knowledge:

- Several years of industry-related experience in tunnelling construction
- At least a High School diploma or certification from a vocational school

Skills:

- Great team working skills
- Good communication skills
- Awareness of health and safety measures

Attributes (Attitude/Safety/Environmental):

- Be physically fit for standing for long period
- comfortable working in enclosed spaces

MSIC GROUP : 421
AREA : **Tunnelling Safety**
JOB TITLE : ERT foreman
LEVEL : 3

RESPONSIBILITIES:

Maintain progress and safety during work. Assist tunnel engineer in ensuring temporary works installation is carried out properly and safely. Ensure the ring installed is carried out in accordance with planned sequence and safe manner. Assist and support engineers in carrying out works as assigned and ensuring that the works are carried out to schedule and in accordance with relevant regulations. Coordinate and supervise site workers. Ensure completion of work in accordance with the main contractor program and requirements. Preparation and submission of site daily reports/progress

Knowledge:

- Possess certificate in Building Construction and Supervisor Safety Course (BCSS) and Building Construction Supervisor Safety Course Tunnelling (BCSS-T)
- Minimum 5 years' experience in Tunnelling
- Experience in Slurry Tunnel Boring Machine works

Skills:

- Great team working skills
- Good communication skills
- Awareness of health and safety measures
- Ability to read construction drawings and blueprints

Attributes (Attitude/Safety/Environmental):

- Ability to organize a work schedule
- Ability to solve disputes between workers
- Ability to lift-up to 50 pounds

MSIC GROUP : 421
 AREA : **Tunnelling Safety**
 JOB TITLE : ERT Crew
 LEVEL : 2

RESPONSIBILITIES:

Activate the Emergency Response team. Activate additional response contractors and local resources. Evaluate the Severity, Potential Impact, Safety Concerns, and Response Requirements based on the initial information provided by the First Person On-Scene. Confirm safety aspects at site, including need for personal protective equipment, sources of ignition, and potential need for evacuation. Communicate and provide incident briefings to company superiors, as appropriate. Coordinate/complete additional internal and external notifications. Communicate with the Emergency Response Team, as the situation demands. Direct response and clean-up operations. To take care of injured people's possessions and ensure he / she accompanies the injured people to hospital if needed. To give a report to the Medical Team Leader.

Knowledge:

- Safety and Environment
- Knowledge in fire extinguishing techniques
- Knowledge and experienced to do CPR or SCBA

Skills:

- Use of various types of extinguishers
- First aid, including cardiopulmonary resuscitation (CPR) and self-contained breathing apparatus (SCBA)
- Shutdown procedures
- Chemical spill control procedures
- Search and emergency rescue procedures
- Hazardous materials emergency response

Attributes (Attitude/Safety/Environmental):

- Be courteous, calm, tactful
- Give factual information - do not lie or say "no comment"
- Clear holding statements / news release with senior management
- Prepared answers to expected questions by media
- Hold regular news briefings, if appropriate
- Correct misunderstanding / misinformation
- Log all calls (with caller's names, times, and dates)
- Instruction & Directives
- No admission of liability
- No estimate of damage

MSIC GROUP : 421
AREA : **Tunnelling Safety**
JOB TITLE : Tunnel Crew
LEVEL : 1

RESPONSIBILITIES:

Using computers with construction management software to help keep the work running smoothly. Preparing the site for tunnelling work. Organising the delivery and storage of all the equipment. Ensuring the correct materials are available to start work. Moving and handling materials, resources, and components by mechanically assisted or manual means. Loading and unloading, handling, and conveying goods and materials.

Knowledge:

- Several years of industry-related experience in tunnelling construction
- At least a High School diploma or certification from a vocational school

Skills:

- Great team working skills
- Good communication skills
- Awareness of health and safety measures

Attributes (Attitude/Safety/Environmental):

- Be physically fit for standing for long period
- comfortable working in enclosed spaces

MSIC GROUP : 421
 AREA : **Beam Launching**
 JOB TITLE : Site Engineer
 LEVEL : 5

RESPONSIBILITIES:

Plan, schedule, or coordinate site activities to meet deadlines. Prepare project costing and request budget estimates. Inspect or review project deliverables to monitor compliance with requirement Monitor work progress. Plan and organize construction maintenance activities. Interpret project brief to identify work sequence and appropriate construction method. Interpret method statement to determine and monitor execution of procedure/work sequence for the project. Prepare master work program/ project milestone. Direct and supervise construction contractor, sub-contractor, or related worker. Identify and report any errors or discrepancies on construction drawing/shop drawing. Propose technical solution to resolve discrepancies on construction drawing/shop drawing/value engineering. Develop or implement quality control and environmental protection programme. Prepare progress claim for construction work. Prepare variation order. Analyse and verify submission by coordinator. Attend technical and site meetings. Produce as-built drawing.

Knowledge:

- Minimum Diploma in Business Management and/or level 4 qualifications Civil Engineering.
- Minimum five years of experience in Civil Works.
- Ideally holding Chartered Civil / Structural Engineer status. And a formal health and safety qualification.
- Having civil construction industry (large infrastructure projects) experience of 8-10 years recommended.
- Demonstrated experience in asset management, civil construction and maintenance.
- Demonstrated ability to coordinate, plan and prioritize works programs using the best practices.
- Knowledge of Occupational Health and Safety policies and procedures.

Skills:

- Alert on production abnormalities
- Concern on environmental issues
- Customer orientation skills
- Detail in performing part inspection
- Firm in decision making
- Good communication with subordinates
- High level of commitment and strong team player
- Informative in preparing production plan
- Knowledgeable and professionalism in work
- Leadership skills and self-Development skills
- Meticulous in evaluate parts data
- Report writing and presentation skills
- Strong interpersonal skills with good attention to details

- Proficient in the use of Microsoft Office applications and GIS systems.

Attributes (Attitude/Safety/Environmental):

- Ability to adapt with workplace environment
- Demonstrated ability to lead a team including the ability to select and recruit, mentor and motivate.
- team members and promote continuous improvement.
- Ability to work under pressure
- Adhere to safety regulations, production quality standard
- Demonstrated ability to monitor, control and oversee large budget.

MSIC GROUP : 421
AREA : **Beam Launching**
JOB TITLE : Beam Launcher Senior Supervisor
LEVEL : 4

RESPONSIBILITIES:

Reporting to the Construction Manager. Day-to-day management of the site, including supervising and monitoring the site labour force and the beam launching works of any subcontractors to ensure within time and quality. Planning the beam launching work and efficiently organizing the plant and site facilities to meet agreed deadlines. Liaise with consultants on all site matters, e.g., timely issuance of construction drawings, follow up on drawings, amendments, etc. Observe and ensure all equipment and procedures comply with safety regulations. Coordinates with sub-contractors on details, sequence, and programme of works. Ensuring that all materials used are within budgeted quantity and work performed are as per specifications. Measurement and valuation in collaboration with Contracts Department where appropriate, providing data in respect of variation orders and site instructions.

Knowledge:

- Candidate must possess at least Professional Certificate, Diploma, or equivalent.
- At least 4 Year(s) of working experience in the related field will be an advantage.
- Able to handle 20 – 30 site workers.
- Preferably candidates specialized in beam launching

Skills:

- Ability to interpret blueprints
- Strong communication and interpersonal skills.
- Basic computer skills.

Attributes (Attitude/Safety/Environmental):

- Ability to nurture effective professional relationships with staff and clients
- Willing to travel to any project site at any time.
- Possess own transport.
- Able to work under minimum supervision, independently, and in a team.
- Able to work long hours, weekends and Public Holidays when required.

MSIC GROUP : 421
 AREA : **Beam Launching**
 JOB TITLE : Beam Launcher Supervisor
 LEVEL : 3

RESPONSIBILITIES:

Liaise with managers. Check compatibility of materials. Ensure compliance with construction project deadline. Coordinate construction activities. Inspect construction supplies. Supervise staff. Identify defects in concrete. Evaluate employees work. Identify external risks to bridge integrity. Follow health and safety procedures in construction. Work in construction team. Plan resource allocation. Plan shifts of employees. Use safety equipment in construction. Conduct quality control analysis. React events in time-critical environments. Manage health and safety standards. Interpret 3D plans. Monitor stock level. Process incoming construction supplies. Interpret 2D plans. Secure working area. Prevent damage to utility infrastructure.

Knowledge:

- Professional Certificate, Diploma, Advanced/Higher/Graduate Diploma, Bachelor's Degree, Post Graduate Diploma, Professional Degree
- Knowledge of construction tools and equipment
- Completion of a post-secondary education construction training program.
- Bachelor's degree in construction management, construction science, civil engineering, or related field is preferred.
- Proven experience working as a site supervisor.
- CPR and first aid certifications.
- Sound knowledge of building codes and construction safety regulations.

Skills:

- Ability to interpret blueprints
- Outstanding leadership skills
- Strong analytical and problem-solving skills
- Excellent organizational and communication skills

Attributes (Attitude/Safety/Environmental):

- Ability to nurture effective professional relationships with staff and clients
- Strong project management abilities
- Confidence to thrive under pressure
- Professional demeanour and attitude

MSIC GROUP : 421
AREA : **Beam Launching**
JOB TITTLE : Beam Launcher Operator
LEVEL : 2

RESPONSIBILITIES:

Operate tools, equipment, and machinery. Carry out construction works according to instruction and drawing. Carry out routine maintenance in accordance with routine schedule. Perform loading and unloading activities of materials. Perform housekeeping. Adhere to safety, health, and environment regulation.

Knowledge:

- High School graduate with extensive working experience in beam launching
- At least 5 years work experience in construction field
- Considerable knowledge of equipment, methods, techniques, hand/power tools in beam launching
- Knowledge of concrete
- Knowledge of beams, application techniques and necessary safety precautions.
- Knowledge of the design regulations of traffic lines, etc.
- Knowledge of applicable safety regulations.

Skills:

- Ability to work in tense and pressure environment.
- Problem solution skill.
- Fluency in English and Malay
- Excellent verbal and written communication skills.

Attributes (Attitude/Safety/Environmental):

- Physical coordination necessary to carry out the duties of the position.

MSIC GROUP : 421
 AREA : **Bridge Structure (Prestressed)**
 JOB TITLE : Pre & Post Tensioned Senior Supervisor
 LEVEL : 4

RESPONSIBILITIES:

Supervises and coordinates activities of workers engaged in assembly of pre-cut wood and metal forms for moulding reinforced concrete slabs and beams and pouring and finishing of concrete: Lays out and marks measurements for assembly of new forms on prepared moulding floor, from blueprints and drawings. Directs workers engaged in bolting or clamping together of forms and tightens bolts to attain prescribed tension on wire or cable reinforcing members, using wrench equipped with torque gauge. Directs workers engaged in mixing and pouring of concrete into moulds. Finishes concrete to impart uniform texture, using trowel, floats, and other hand tools or work aids. Releases tension on reinforcing members during drying and curing process, using wrench, to impart slight arc and increase strength of concrete.

Knowledge

- Candidate must possess at least Professional Certificate, Diploma, or equivalent.
- At least 4 Year(s) of working experience in the related field will be an advantage.
- Able to handle 20 – 30 site workers.
- Preferably candidates specialized in prestressed concrete design

Skills:

- Ability to interpret blueprints
- Strong communication and interpersonal skills.
- Basic computer skills.

Attributes (Attitude/Safety/Environmental):

- Ability to nurture effective professional relationships with staff and clients
- Willing to travel to any project site at any time.
- Possess own transport.
- Able to work under minimum supervision, independently, and in a team.
- Able to work long hours, weekends and Public Holidays when required.

MSIC GROUP : 421
 AREA : **Bridge Structure (Prestressed)**
 JOB TITLE : Pre & Post Tensioned Supervisor
 LEVEL : 3

RESPONSIBILITIES:

Assist in planning physical work activities in respective trade. Prepare daily work schedule. Assign work based on job tasks. Brief workers on work procedures. Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc) to determine work requirements. Coordinate work activities. Monitor usage of equipment on construction sites to verify safety and specification compliance. Carry out regular work inspections. Identify and request the requirement materials, manpower and machinery. Attend technical and site meetings.

Compile site document or record to prepare report. Raise site safety concerns and identify construction hazard and risk. Report site matters to superior or management. Supervise subordinate work. Supervise compliance of safety, health, and environment requirements. Arrange for maintenance activities. Perform subordinate appraisal. Conduct training for construction methods, operation of machinery and equipment, site safety requirement. Troubleshoot and rectify within work scope. Prepare and compile reports for site activities including QA QC documents, SHE documents.

Knowledge:

- Professional Certificate, Diploma, Advanced/Higher/Graduate Diploma, Bachelor's Degree, Post Graduate Diploma, Professional Degree
- Knowledge of construction tools and equipment
- Knowledge of prestressed concrete design
- Completion of a post-secondary education construction training program.
- Bachelor's degree in construction management, construction science, civil engineering, or related field is preferred.
- Proven experience working as a site supervisor.
- CPR and first aid certifications.
- Sound knowledge of building codes and construction safety regulations.

Skills:

- Ability to interpret blueprints
- Outstanding leadership skills
- Strong analytical and problem-solving skills
- Excellent organizational and communication skills

Attributes (Attitude/Safety/Environmental):

- Ability to nurture effective professional relationships with staff and clients
- Strong project management abilities
- Confidence to thrive under pressure
- Professional demeanour and attitude

MSIC GROUP : 421
 AREA : **Bridge Structure (Prestressed)**
 JOB TITLE : Pre & Post Tensioned Crew
 LEVEL : 2

RESPONSIBILITIES:

Performs any combination of following duties involved in preparing forms and pouring concrete to make prestressed structural beams: Cleans forms, using hammer, scraper, and brush, and sprays form with oil to prevent adhesion of concrete. Places reinforcing steel cage in form, using power winch. Pushes stressing cables through form, threads end through guide holes in end plates, and clamps end of cables to plate. Tightens nuts at base of form with power wrench and inserts spacer bars and locking pins at intervals along top of form to maintain specified dimensions of form. Clamps vibrators in holders on sides of forms. Lays planks on protruding ends of spacer bars to make elevated walkway on both sides of form. Lifts four-wheeled pouring buggy into position on walkway, using winch. Lifts belt conveyor into position between pouring buggy and ready-mix truck with winch and bolts it to truck, using power wrench. Starts conveyor and vibrators. Shovels sample of concrete into canisters and tests consistency of concrete, using cone-shaped mould and trowel. Pushes pouring buggy along walkway to follow ready-mix truck. Settles concrete at top of form with hand vibrator and fills low spots with concrete taken from conveyor.

Removes forms from cured beams, using hand tools, and cuts protruding end of stressing cable, using oxyacetylene torch. Lifts beam, using four-wheeled portable hoist, and moves hoist to yarding area by hand or with truck. May prepare forms and cast concrete lintels.

Knowledge:

- Several years of industry-related experience in construction of buildings or infrastructures by using prestressed components
- At least a High School diploma or certification from a vocational school

Skills:

- Great team working skills
- Good communication skills
- Awareness of health and safety measures

Attributes (Attitude/Safety/Environmental):

- Be physically fit for standing for long period
- comfortable working in enclosed spaces

MSIC GROUP : 421
 AREA : **Bridge Structure (Concrete Work)**
 JOB TITLE : Bridge Structure Senior Supervisor
 LEVEL : 4

RESPONSIBILITIES:

Reporting to the Construction Manager. Day-to-day management of the site, including supervising and monitoring the site labour force and the bridge structural works of any subcontractors to ensure within time and quality. Planning the bridge project works work and efficiently organizing the plant and site facilities to meet agreed deadlines. Liaise with consultants on all site matters, e.g., timely issuance of construction drawings, follow up on drawings, amendments, etc. Observe and ensure all equipment and procedures comply with safety regulations. Coordinates with sub-contractors on details, sequence, and programme of works. Ensuring that all materials used are within budgeted quantity and work performed are as per specifications. Measurement and valuation in collaboration with Contracts Department where appropriate, providing data in respect of variation orders and site instructions.

Knowledge

- Candidate must possess at least Professional Certificate, Diploma, or equivalent.
- At least 4 Year(s) of working experience in the related field will be an advantage.
- Able to handle 20 – 30 site workers.
- Preferably candidates specialized in bridge design and construction

Skills:

- Ability to interpret blueprints
- Strong communication and interpersonal skills.
- Basic computer skills.

Attributes (Attitude/Safety/Environmental):

- Ability to nurture effective professional relationships with staff and clients
- Willing to travel to any project site at any time.
- Possess own transport.
- Able to work under minimum supervision, independently, and in a team.
- Able to work long hours, weekends and Public Holidays when required.

MSIC GROUP : 421
 AREA : **Bridge Structure (Concrete Work)**
 JOB TITLE : Bridge Structure Supervisor
 LEVEL : 3

RESPONSIBILITIES:

Assist in planning physical work activities in respective trade. Prepare daily work schedule. Assign work based on job tasks. Brief workers on work procedures. Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc) to determine work requirements. Coordinate work activities. Monitor usage of equipment on construction sites to verify safety and specification compliance. Carry out regular work inspections. Identify and request the requirement materials, manpower and machinery. Attend technical and site meetings. Compile site document or record to prepare report. Raise site safety concerns and identify construction hazard and risk. Report site matters to superior or management. Supervise subordinate work. Supervise compliance of safety, health, and environment requirements. Arrange for maintenance activities. Perform subordinate appraisal. Conduct training for construction methods, operation of machinery and equipment, site safety requirement. Troubleshoot and rectify within work scope. Prepare and compile reports for site activities including QA QC documents, SHE documents.

Knowledge:

- Professional Certificate, Diploma, Advanced/Higher/Graduate Diploma, Bachelor's Degree, Post Graduate Diploma, Professional Degree
- Knowledge of construction tools and equipment
- Knowledge of bridge design and construction
- Knowledge of reinforced and prestressed concrete design
- Completion of a post-secondary education construction training program.
- Bachelor's degree in construction management, construction science, civil engineering, or related field is preferred.
- Proven experience working as a site supervisor.
- CPR and first aid certifications.
- Sound knowledge of building codes and construction safety regulations.

Skills:

- Ability to interpret blueprints
- Outstanding leadership skills
- Strong analytical and problem-solving skills
- Excellent organizational and communication skills

Attributes (Attitude/Safety/Environmental):

- Ability to nurture effective professional relationships with staff and clients
- Strong project management abilities
- Confidence to thrive under pressure
- Professional demeanour and attitude

MSIC GROUP : 421
AREA : **Bridge Structure (Concrete Work)**
JOB TITLE : Bridge Structure Concreter
LEVEL : 2

RESPONSIBILITIES:

Perform work as per construction drawing and method statement. Carry out concreting work. Carry out loading and unloading of material. Carry out concreting work related to water proofing. Assist in carrying out sample testing. Assist in taking concrete sample for testing. Carry out concrete mixing. Handle tools and equipment. Perform routine maintenance.

Knowledge:

- Several years of industry-related experience apprenticeship
- At least a High School diploma or certification from a vocational school

Skills:

- Shovelling concrete
- Spreading concrete using vibrations and levels
- Manually screeding concrete by bending and using a hand screed
- Good communication and interpersonal skills which enable a concrete labourer to work closely with co-workers and contractors
- Strong precision skills, as a concrete labourer must be able to mix, pour, and spread concrete in the proper proportion
- Well-developed safety skills which enable him/her to take careful and mindful actions since construction sites pose a lot of danger

Attributes (Attitude/Safety/Environmental):

- Be physically fit for standing, kneeling, and crouching positions
- Ability to perform strenuous tasks with hands
- Ability to kneel, bend and lift heavy materials
- Ability to measure accurately and read specifications

MSIC GROUP : 421
 AREA : **Bridge Structure (Reinforcement Work)**
 JOB TITLE : Bridge Structure Bar Benders
 LEVEL : 2

RESPONSIBILITIES:

Read and understand routine drawings/sketches and Bar Bending Schedule: Basic concepts of drawings/sketches and Bar Bending Schedule used in routine works. Use hand and power tools for cutting and bending of reinforcement: Selection and use of hand and power tools for reinforcement steel cutting and bending. Prepare, fabricate, place, and fix reinforcement for R.C.C structures: Methods and standard procedure for fabricating, placing and fixing of reinforcement steel for R.C.C structures. Work effectively in a team to deliver desired results at the workplace: Organized working procedure within a team at site. Plan and organize work to meet expected outcomes: Prioritizing activities and organizing resources to meet desired outcome. Work according to personal health, safety, and environment protocol at construction site: Importance of Health & Safety aspects & measures to be followed while working. Work effectively in a team to deliver desired results at the workplace: - Organised working procedure within a team at site

Knowledge:

- For Non trained worker: 5 years site experience in same occupation
- For Trained worker: 2 years site experience as a certified Assistant Bar Bender & steel fixer
- Recommended training period of 8-12 weeks as per QP of Bar Bender & Steel Fixer Normal literacy of reading, writing, and understanding
- safety measures for use of different types of hand and power tools
- different types of power tools, accessories for cutting, bending, and threading of reinforcement
- fix cutting blade and other accessories in cutting and bending machine
- knowledge about capacity and required details of cutting machines, bending machine, and threading machine
- use of CNC machine for reinforcement works
- methods of protecting steel from rusting
- tolerance limits for bending and cutting of rebars
- tagging procedures for rebars basis shape, size, and location
- types of hand tool available for cutting and bending
- use of measurement and marking tools
- simple arithmetic calculation
- simple measurements using metric and imperial systems
- understand BBS in order to carry out cutting and bending of reinforcement
- conversion of linear unit for measurement KB15.unit weight of steel
- method and knowledge of storing cut rebars and scrap material

Skills:

- Writing skills
- Reading skills
- Oral communications (Listening and speaking skills)

- Decision making
- Plan and organize
- Problem solving
- Customer centricity
- Analytical thinking
- Critical thinking

Attributes (Attitude/Safety/Environmental):

- The individual is expected to be physically fit and should be able to work across various locations in withstanding extreme conditions while working.
- The individual should be organized, diligent, methodical, and able to implement and maintain safety practices.

MSIC GROUP : 421
 AREA : **Bridge Structure (Rigging)**
 JOB TITLE : Bridge Structure Senior Supervisor
 LEVEL : 4

RESPONSIBILITIES:

Reporting to the Construction Manager. Day-to-day management of the site, including supervising and monitoring the site labour force and the bridge structural works of any subcontractors to ensure within time and quality. Planning the bridge project works work and efficiently organizing the plant and site facilities to meet agreed deadlines. Liaise with consultants on all site matters, e.g., timely issuance of construction drawings, follow up on drawings, amendments, etc. Observe and ensure all equipment and procedures comply with safety regulations. Coordinates with sub-contractors on details, sequence, and programme of works. Ensuring that all materials used are within budgeted quantity and work performed are as per specifications. Measurement and valuation in collaboration with Contracts Department where appropriate, providing data in respect of variation orders and site instructions.

Knowledge

- Candidate must possess at least Professional Certificate, Diploma, or equivalent.
- At least 4 Year(s) of working experience in the related field will be an advantage.
- Able to handle 20 – 30 site workers.
- Preferably candidates specialized in bridge design and construction

Skills:

- Ability to interpret blueprints
- Strong communication and interpersonal skills.
- Basic computer skills.

Attributes (Attitude/Safety/Environmental):

- Ability to nurture effective professional relationships with staff and clients
- Willing to travel to any project site at any time.
- Possess own transport.
- Able to work under minimum supervision, independently, and in a team.
- Able to work long hours, weekends and Public Holidays when required.

MSIC GROUP : 421
 AREA : **Bridge Structure (Rigging)**
 JOB TITLE : Bridge Structure Supervisor
 LEVEL : 3

RESPONSIBILITIES:

Assist in planning physical work activities in respective trade. Prepare daily work schedule. Assign work based on job tasks. Brief workers on work procedures. Read and interpret construction documents (such as masterplan, method statement, construction drawing, etc) to determine work requirements. Coordinate work activities. Monitor usage of equipment on construction sites to verify safety and specification compliance. Carry out regular work inspections. Identify and request the requirement materials, manpower and machinery. Attend technical and site meetings. Compile site document or record to prepare report. Raise site safety concerns and identify construction hazard and risk. Report site matters to superior or management. Supervise subordinate work. Supervise compliance of safety, health, and environment requirements. Arrange for maintenance activities. Perform subordinate appraisal. Conduct training for construction methods, operation of machinery and equipment, site safety requirement. Troubleshoot and rectify within work scope. Prepare and compile reports for site activities including QA QC documents, SHE documents.

Knowledge:

- Professional Certificate, Diploma, Advanced/Higher/Graduate Diploma, Bachelor's Degree, Post Graduate Diploma, Professional Degree
- Knowledge of construction tools and equipment
- Knowledge of bridge design and construction
- Knowledge of reinforced and prestressed concrete design
- Completion of a post-secondary education construction training program.
- Bachelor's degree in construction management, construction science, civil engineering, or related field is preferred.
- Proven experience working as a site supervisor.
- CPR and first aid certifications.
- Sound knowledge of building codes and construction safety regulations.

Skills:

- Ability to interpret blueprints
- Outstanding leadership skills
- Strong analytical and problem-solving skills
- Excellent organizational and communication skills

Attributes (Attitude/Safety/Environmental):

- Ability to nurture effective professional relationships with staff and clients
- Strong project management abilities
- Confidence to thrive under pressure
- Professional demeanour and attitude

MSIC GROUP : 421
 AREA : **Bridge Structure**
 JOB TITLE : Bridge Structure Rigger
 LEVEL : 2

RESPONSIBILITIES:

Observe equipment gauges and indicators and hand signals of other workers to verify load positions or depths. Move levers, pedals, and throttles to stop, start, and regulate speeds of hoist or winch drums in response to hand, bell, buzzer, telephone, loud-speaker, or whistle signals, or by observing dial indicators or cable marks. Signal and assist other workers loading or unloading materials. Start engines of hoists or winches and use levers and pedals to wind or unwind cable on drums. Select loads or materials according to weight and size specifications. Move or reposition hoists, winches, loads and materials, manually or using equipment and machines such as trucks, cars, and hand trucks. Attach, fasten, and disconnect cables or lines to loads, materials, and equipment, using hand tools. Operate compressed air, diesel, electric, gasoline, or steam-driven hoists or winches to control movement of cableways, cages, derricks, draglines, loaders, railcars, or skips. Repair, maintain, and adjust equipment, using hand tools. Apply hand or foot brakes and move levers to lock hoists or winches. Oil winch drums so that cables will wind smoothly. Tend auxiliary equipment, such as jacks, slings, cables, or stop blocks, to facilitate moving items or materials for further processing. Climb ladders to position and set up vehicle-mounted derricks.

Knowledge:

- Construction/Heavy Equipment/Earthmoving Equipment Operation
- Mechanical - Knowledge of machines and tools, including their designs, uses, repair, and maintenance.

Skills:

- Critical Thinking
- Monitoring
- Operation Monitoring
- Time management
- Operation and control
- Active listening
- Complex problem solving
- Judgement and decision making

Attributes (Attitude/Safety/Environmental):

- Able to work in noisy and dirty environments
- Must be in good physical condition
- Good eyesight and ability to judge distance
- Able to give and take instructions, solve problems and work well with others

MSIC GROUP : 421
 AREA : **Bridge Bearing**
 JOB TITLE : Bridge Bearing Installer
 LEVEL : 2

RESPONSIBILITIES:

Install in accordance with the specifications of the bearing installation plan (dimensions, ground levels and positions, inclinations, lateral and longitudinal position, material quality of the bearing joint, pre-setting). Adjust bearing according to the position and direction in the layout as well as the height and slope in the elevation. Use temporary supports to adjust the position of the bearing. The temporary supports under bearing plates shall be compressible under design loading (to avoid hard spots) if not removed once the bedding material has reached the required strength. Unless considered in the design of the structure and the bearings, the bearing shall be located so that its position does not deviate more than 3 mm (value is recommended by VHFL acc. prEN 1337-1) from its nominal position in any direction. Install bearing horizontally. A deviation from the horizontal X and Y axis should not exceed 3 ‰ and 5 ‰ for elastomer bearings after casting. For sloped bridges, the structural engineer may prefer the bearings to be aligned in parallel to the local gradient. In any case, -the sliding plate and the lower part of the bearing shall be parallel (such that the gradient is not accommodated by the rotational element of the bridges) -the alignment of the bearings must match the alignment foreseen by the structural engineer Association of the manufacturers for expansion joints and bearings (VHFL) VHFL Guideline 2 Information for construction sites: Installation of bridge bearings Edition 2020-04 9 The X-axis marked on the upper bearing plate must match with the displacement direction specified in the bearing installation plan. Ensure the maximum deviation from the nominal displacement direction in plane shall not exceed 3 ‰. Check the direction of the pre-setting (red arrow on the upper bearing plate)

Knowledge:

- Experienced with bridge bearing installation
- Carpentry experience
- OSHA 10 or 30
- Lift Certification
- CPR/First aid

Skills:

- Ability to read construction documents
- Ability to read a tape measure and measure accurately
- Experience with mitre/band saw
- Problem solving skills
- Good work ethic

Attributes (Attitude/Safety/Environmental):

- Valid Drivers License
- Ability to lift 50 pounds and over

MSIC GROUP : 421
AREA : **Bridge Expansion Joint**
JOB TITLE : Expansion Joint Installer
LEVEL : 2

RESPONSIBILITIES:

Expansion Joint Installer known for professional, quality work and out-of-the-box solutions. Pay is above industry average, training provided, and there is plenty of room for growth! Expansion Joint Installer would travel to job site locations across the country to implement Expansion Joints. Responsible for taking measurements, cutting to exact specifications, and fitting and fastening the joint to the wall, floor or ceiling depending on the customer requirements. Problem solving will be key as most of the drywall or insulation is not measured to spec. Developing relationships with the General Contractor and subs to enlist their help in these situations will also be necessary. Other duties as required.

Knowledge:

- Experienced with expansion joints
- Carpentry experience
- OSHA 10 or 30
- Lift Certification
- CPR/First aid

Skills:

- Ability to read construction documents
- Ability to read a tape measure and measure accurately
- Experience with mitre/band saw
- Problem solving skills
- Good work ethic

Attributes (Attitude/Safety/Environmental):

- Valid Drivers License
- Ability to lift 50 pounds and over

MSIC GROUP : 422
 AREA : **Pipeline (Cutting / Joining)**
 JOB TITTLE : Pipeline Fitter II
 LEVEL : 2

RESPONSIBILITIES:

Reliable pipe fitter II able to plan, install and maintain piping systems in industrial and residential properties. The pipe fitter II will be responsible for reviewing blueprints, planning, installing, and maintaining piping systems and related equipment. To be successful as a pipe fitter II should have ample experience in welding and installing pipe systems according to specifications. Ultimately, a top pipe fitter has excellent mechanical skills and a good understanding of the requirements and precautions necessary for working with pipes conveying dangerous chemicals and liquids.

Knowledge:

- High school education.
- CIDB Pipeline Fitter Course.
- Excellent mechanical and troubleshooting skills.
- Ability to prioritize and maintain strong attention to detail.
- Good communication and managerial skills.
- Physical dexterity.

Skills:

- Work in a construction team
- Mechanical Skills: Pipefitters are able to utilize and operate a range of tools and equipment in installing, maintaining, and repairing pipe systems
- Physical Strength: Pipefitter are able to handle, lift, and move heavy pipes, pipefitting materials and equipment
- Troubleshooting Skills: Pipefitter are skilled in diagnosing pipe systems to identify and fix problems with leaks and clogs
- Assessment tests: Pipefitter apprenticeship program or a job, you may likely be asked to take an assessment test.

Attributes (Attitude/Safety/Environmental):

- Ability to hear, speak, and understand the spoken English & Malay word.
- Ability to read and understand directions in English & Malay
- Occasional ability to lift, carry and put away things

MSIC GROUP : 422
AREA : **Pipeline (Cutting / Joining)**
JOB TITLE : Pipeline Fitter I
LEVEL : 1

RESPONSIBILITIES:

Inspecting the workplace, clearing obstructions and preparing materials and equipment. Reliable pipe fitter I able to help to install and maintain piping systems in industrial and residential properties. Clearing pipe systems of obstructions to testing their functionality.

Knowledge:

- CIDB Pipeline Fitter Course.
- Good communication and managerial skills.
- Physical dexterity.

Skills:

- Work in a construction team
- Mechanical Skills: Pipefitters are able to help on operate a range of tools and equipment in installing, maintaining, and repairing pipe systems
- Physical Strength: They are able to help for handling, lifting, and move heavy pipes, pipefitting materials and equipment
- Troubleshooting Skills: They are skilled in helping diagnosing pipe systems to identify and fix problems with leaks and clogs

Attributes (Attitude/Safety/Environmental):

- Ability to hear, speak, and understand the spoken English & Malay word.
- Ability to read and understand directions in English & Malay
- Occasional ability to lift, carry and put away things

MSIC GROUP : 422
 AREA : **Pipeline (Jacking)**
 JOB TITLE : Assistant Pipe Jacking Operator
 LEVEL : 2

RESPONSIBILITIES:

Able to operate pipe jacking machine, through the control room; control of micro-tunnelling/pipe jacking machine. Ability to skilfully steer machine remotely below ground to the destination. Ensure the projects are executed within the approved schedule and according to project parameters. Preparation, Installation and dismantling of all equipment on site. Ensure preventive maintenance of all equipment are performed appropriately.

Knowledge:

- mechanical systems
- mechanics
- electricity
- machinery load capacity
- Min Nitec in Engineering / Construction or equivalent
- Min 2 years of working experience in building construction industry / project site work (No experience is welcome to apply)

Skills:

- coordinate pipe jacking
- drive mobile heavy construction equipment
- keep heavy construction equipment in good condition
- keep personal administration
- monitor excavated material
- operate excavator
- set up temporary construction site infrastructure
- work in a construction team

Attributes (Attitude/Safety/Environmental):

- Realistic / Conventional
- Realistic / Enterprising
- Realistic / Investigative

MSIC GROUP : 422
AREA : **Manholes (Brick Work)**
JOB TITLE : Manholes Bricklayer
LEVEL : 2

RESPONSIBILITIES:

Laying bricks. Applying or removing mortar with a trowel. Working accurately from detailed plans and specifications. Sealing foundations with damp-resistant materials Using spirit levels and plumb lines to check building alignment. Using hand tools, power tools and brick-cutting machines. Constructing arches and ornamental brickwork. Repairing and maintaining building blocks. Measuring out build areas and setting out the first rows of bricks and damp course. Working outdoors on construction

Knowledge:

- High school diploma or GED is required; secondary education is appreciated and will be considered when determining pay scale
- Experience in bricklaying
- 2-4 years of experience in construction industry is preferred.

Skills:

- Knowledge of building and construction
- Be thorough and pay attention to detail
- Ability to work well with others
- Be flexible and open to change
- Patience and the ability to remain calm in stressful situations
- Ambition and a desire to succeed

Attributes (Attitude/Safety/Environmental):

- Ability to work well with your hands
- Able to carry out basic tasks on a computer or hand-held device

MSIC GROUP : 423
 AREA : **Airport Runway**
 JOB TITLE : Construction Manager***
 LEVEL : 6

RESPONSIBILITIES:

Attend and coordinate all construction matter with various consultant and relevant authorities to meet deadlines. Review project costing and request budget estimates. Review and ensure construction layout design in term of functionality, buildability, maintainability, cost efficient and sustainability aspect are complied with. Interpret project brief to identify work sequence and appropriate construction method. Prepare work program. Interpret method statement to determine and monitor execution of procedure/work sequence for the project. Inspect or review project deliverables to monitor compliance with requirement. Liaise and coordinate with consultant for submission to local authority for approval. Liaise with client, consultant, supplier, contractor, sub-contractor, and all relevant parties for all construction works. Participate in construction management process for smooth progress of construction works. Coordinate constructions work according to Inspection Test Plan. Ensure SHE compliance. Represent company in meetings.

Knowledge:

- Bachelor's degree in Civil Engineering
- Knowledge of construction industry
- construction management
- building management
- building studies
- project management
- surveying.

Skills:

- strong communication skills - for liaising with a range of clients, professionals, and workers on site
- leadership skills and an ability to motivate your team to ensure a high standard of work
- excellent planning and organisational skills - for writing and monitoring project plans and schedules and utilising time and resources effectively
- resilience and problem-solving skills - in order to overcome unexpected challenges during the construction process
- an ability to make decisions under pressure, so that the project can progress
- strong attention to detail for conducting site inspections and managing complex contracts
- an awareness of health and safety procedures and legislation - for running a safe construction site
- sound commercial awareness - to allocate and manage your budget effectively and to understand client concerns
- numerical and IT skills, including knowledge of relevant building methods and project management software to manage information and finances during the project.

Attributes (Attitude/Safety/Environmental):

- Ability to hear, speak, and understand the spoken English & Malay word.
- Ability to read and understand directions in English & Malay
- Ability to sit at and use a computer workstation.
- Ability to stand, work, and drive throughout the day.
- Ability to see and adjust focus at close distances.
- Ability and dexterity to operate a computer keyboard and a numeric keypad by touch.
- Ability to travel to other cities and states via auto, boat, train, or air travel.
- Occasional ability to lift, carry and put away things

MSIC GROUP : 423
 AREA : **Airport Runway**
 JOB TITLE : Site Engineer
 LEVEL : 5

RESPONSIBILITIES:

Plan, schedule, or coordinate site activities to meet deadlines. Prepare project costing and request budget estimates. Inspect or review project deliverables to monitor compliance with requirement Monitor work progress. Plan and organize construction maintenance activities. Interpret project brief to identify work sequence and appropriate construction method. Interpret method statement to determine and monitor execution of procedure/work sequence for the project. Prepare master work program/ project milestone. Direct and supervise construction contractor, sub-contractor, or related worker. Identify and report any errors or discrepancies on construction drawing/shop drawing. Propose technical solution to resolve discrepancies on construction drawing/shop drawing/value engineering. Develop or implement quality control and environmental protection programme. Prepare progress claim for construction work. Prepare variation order. Analyse and verify submission by coordinator. Attend technical and site meetings. Produce as-built drawing.

Knowledge:

- Minimum Diploma in Business Management and/or level 4 qualifications Civil Engineering.
- Minimum five years of experience in Civil Works.
- Ideally holding Chartered Civil / Structural Engineer status. And a formal health and safety qualification.
- Having civil construction industry (large infrastructure projects) experience of 8-10 years recommended.
- Demonstrated experience in asset management, civil construction, and maintenance.
- Demonstrated ability to coordinate, plan and prioritize works programs using the best practices.
- Knowledge of Occupational Health and Safety policies and procedures.

Skills:

- Alert on production abnormalities
- Concern on environmental issues
- Customer orientation skills
- Detail in performing part inspection
- Firm in decision making
- Good communication with subordinates
- High level of commitment and strong team player
- Informative in preparing production plan
- Knowledgeable and professionalism in work
- Leadership skills and self-Development skills
- Meticulous in evaluate parts data
- Report writing and presentation skills
- Strong interpersonal skills with good attention to details

- Proficient in the use of Microsoft Office applications and GIS systems.

Attributes (Attitude/Safety/Environmental):

- Ability to adapt with workplace environment
- Demonstrated ability to lead a team including the ability to select and recruit, mentor, and motivate.
- team members and promote continuous improvement.
- Ability to work under pressure
- Adhere to safety regulations, production quality standard
- Demonstrated ability to monitor, control and oversee large budget.

MSIC GROUP : 423
 AREA : **Airport Runway**
 JOB TITLE : Airport Runway Coordinator
 LEVEL : 4

RESPONSIBILITIES:

Inspects airfield, safety zones, clear zones, approach zones, terminal, perimeter fence line and airport grounds for compliance with Federal Aviation Regulations, Transportation Security Administration Regulations, Airport Rules & Regulations, Airport Minimum Standards, leases, and agreements. Assures that the airport is operated in a safe and secure manner within the position's limited responsibilities. Coordinates repair of all airport's damaged property found in inspections. Ascertain that repair meet pre-set specifications. Monitors ground transportation operations and overall program. Plans, directs, and coordinates all non-routine airfield activity (i.e., reassigning air carrier gate positions; opening and closing runways and taxiways; static displays; dignitary arrivals and departures; construction projects; escorts). Identifies and determines general nature and extent of problems; determines location; assesses problem urgency; and determines priorities in order to relay information on a timely basis. Contacts appropriate agencies by telephone or radio to obtain assistance. Develops quality and productivity improvement capabilities to improve services and effectiveness. Maintains logs, records, and prepares reports. Issue Notice of Violations and parking citations as necessary. Utilizes checklists in the performance of duties. Assists with coordination of simulated disaster drill and tabletop exercises, round table discussion follow-up and evaluation. Conducts Notice to Airmen (NOTAM) training and issues NOTAMs when appropriate. Conducts airfield inspection after severe weather storms and other special conditions that may affect aircraft operating characteristics. Perform related work as required. Responds to emergency incidents, protecting airport interests until supervisory personnel arrive. Coordinates emergency response to minor incidents, or anticipated events related to weather. Maintains the security identification system. Issues airport security identification badges. Keeps records. Investigates accidents and incidents and writes reports about them. Recommends policy changes to correct reoccurring problems. Performs related work as required.

Knowledge:

- Knowledge of Airport safety, security, emergency preparedness, planning and training.
- Knowledge of Federal and state laws involving airports
- Knowledge of appropriate interaction with the National
- Transportation Safety Board (NTSB), Federal Aviation Administration (FAA), Transportation Security Administration (TSA) and Airports Flight Standards District Office (AFSDO).

Skills:

- Ability to communicate effectively orally and in writing.
- Ability to speak distinctly and communicate effectively with the public and other personnel.
- Ability to take quick and accurate action under all types of operating conditions.
- Ability to establish and maintain effective working relationships as necessitated by the work.

- Ability to prepare reports and maintain records.
- Ability to speak in public and assemble and conduct safety and/or training sessions relevant to employee's safety and risk factors and accident prevention.
- Demonstrates interpersonal facilitation and communication skills.
- Skill in the use of equipment, including personal computers and associated programs and applications, necessary for job performance.

Attributes (Attitude/Safety/Environmental):

- High level of commitment and strong team player
- Result oriented mind-set
- Good communication and problem-solving with subordinates
- Good management skills

MSIC GROUP : 423
 AREA : **Airport Runway**
 JOB TITLE : Airport Runway Supervisor
 LEVEL : 3

RESPONSIBILITIES:

Identifies and anticipates operational, safety and security concerns by inspecting all areas of the airport, to include airside, landside, and terminal facilities. Maintains satisfactory conditions of airside, landside, and terminal facilities by creating work orders and performing light maintenance duties. Supervises and performs airside operations activities including, but not limited to identifying, preventing, responding to and/or removing all hazards to aviation including FOD, wildlife, AOA incursions, unauthorized vehicles and pedestrian entry, and disabled aircraft. Supervises snow removal operations during assigned shift. Inspects and maintains a record of all aeronautical areas including pavement, markings, lighting, safety areas, wildlife, construction, emergency equipment and fuelling practices. Coordinates construction and maintenance on or near the airport to ensure minimum interference with airport operations. Responsible for issuing airport identification badges to all airport users. Conducts AOA Driver's training and Airport Security training. Monitors deviations from federal, state and airport operating rules and regulations and issues work orders and NOTAMS as required. Maintains a working knowledge of all applicable FAR's and Advisory Circulars. Performs weather observations as required. Performs Aircraft Rescue and Firefighting (ARFF) duties and carries out responsibilities outlined in the Airport Emergency Plan (AEP). Enforces landside parking regulations to include commercial terminal traffic management. Conducts thorough terminal inspections and occasionally performs janitorial duties. Supervises and coordinates any contract services related to airport operations. Ensures compliance with Airport Policies and Procedures; initiates corrective actions and counsel's airport users, tenants, and employees as required. Serves as an Alternate Airport Security Coordinator (ASC) for the airport. Conducts Airport Security related functions to include monitoring phones, radios, security cameras, gate systems, sterile/secure area doors, and other duties listed in the ASP. Supports all applicable requirements under all Safety Management Systems (SMS) including tasks, documentation, and written and practical tests. Responsible for maintaining customer contacts through positive lines of communication by professionally representing the Airport and City of Williston through frequent and meaningful contact with the customer. Supervises, assigns work, trains and evaluates airport operations staff. Assumes operational, safety, and security responsibilities in absence of airport management. Be physically present in attendance at the worksite. Perform all work duties and activities in accordance with City policies and procedures. Performs other duties as assigned by the Airport Director and Assistant Airport Director.

Knowledge:

- Knowledge of Airport safety, security, emergency preparedness, planning and training.
- Knowledge of Federal and state laws involving airports
- Knowledge of appropriate interaction with the National Transportation Safety Board (NTSB), Federal Aviation Administration (FAA), Transportation Security Administration (TSA) and Airports Flight Standards District Office (AFSDO).

- Working knowledge of common hazards and safety precautions necessary for light equipment operation.

Skills:

- Skill in the operation of light equipment.
- Ability to work at arduous tasks for sustained periods of time in all types of weather conditions.
- Ability to perform minor preventative maintenance as required.
- Ability to understand and follow written and oral instructions.
- Ability to establish and maintain effective working relationships with other employees and the general public.
- Ability to read and understand documents such as operations and maintenance instructions and procedure manuals.
- Ability to write routine reports and correspondence.
- Ability to speak effectively before groups of customers and employees of the organization.
- Ability to read, write, speak, and understand the English & Malay language effectively
- Ability to apply common sense understanding to carry out instructions furnished in written, oral, or diagram form.
- Ability to deal with problems involving several variables.

Attributes (Attitude/Safety/Environmental):

- Must be able to stand, walk, sit, talk and hear, use hand to finger, handle or feel.
- Climb or balance, stoop, kneel, crouch or crawl and reach with hands and arms.
- Vision requirements include close vision, distance vision, colour vision, peripheral vision, and depth perception.