OCCUPATIONAL FRAMEWORK

SECTION F: CONSTRUCTION

DIVISION 41: CONSTRUCTION OF BUILDINGS

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ABSTRACT

An Occupational Framework (OF) is the outcome of the analysis conducted in identifying the work scope of the occupational areas in terms of competencies. It is used to analyse skilled manpower competency requirements for the industry. The OF aims to provide an overall view of the industry's Occupational Structure (OS) and identify skills gaps, critical job titles and Occupational Descriptions (OD) that would assist in further understanding the job requirements of the various occupations in the industry. The Department of Skills Development (DSD) is the custodian of this document. The OF identifies suitable occupational areas which either require development of skills training programmes or the review and enhancement of existing skills training programmes. The OF for Construction of Buildings is based on the Malaysia Standard Industrial Classification (MSIC) 2008 under Section F – Construction, Division 41 – Construction of Buildings. This document is divided into five chapters, Chapter 1 explains the objectives and scope of the study as well as justification for the selected section and division of MSIC 2008 as a basis for classification of construction of building industry. Chapter 2 provides an overview of the-construction of building industry, highlighting the definition, scope, stakeholders, legislation, initiatives and market intelligence of the industry. Chapter 3 describes the methodology used in the OF development which includes qualitative analysis through brainstorming discussion sessions. Chapter 4 discusses the findings from the focus group discussion conducted that are translated into the Occupational Structure, Occupational Description, Jobs in Demand, Competencies in Demand and Emerging Skills. Lastly, Chapter 5 summarises the total number of job areas, job titles and critical job titles (16 job area with 128 job titles and 48 critical job titles) as well as recommends the National Occupational Skills Standard (NOSS) or National Competency Standard (NCS) that should be developed based on the jobs in demand identified in this OF and the competencies in demand plus emerging skills that should be included in the NOSS and skills training curriculum under DSD.

ABSTRAK

Kerangka Pekerjaan (OF) ialah hasil analisis yang dijalankan dalam mengenalpasti skop kerja bidang kerja dari segi kompetensi. Ia digunakan untuk menganalisis keperluan kecekapan tenaga kerja mahir untuk industri. OF bertujuan memberikan pandangan keseluruhan mengenai Struktur Pekerjaan (OS) industri dan mengenal pasti jurang kemahiran, jawatan pekerjaan kritikal dan Deskripsi Pekerjaan (OD) yang akan membantu dalam memahami lagi keperluan kerja pelbagai pekerjaan dalam industri. Jabatan Pembangunan Kemahiran (JPK) ialah jabatan yang bertanggungjawab dalam membangunkan dokumen ini, di mana OF mengenal pasti bidang pekerjaan yang sesuai sama ada memerlukan pembangunan program latihan kemahiran atau kajian semula dan peningkatan program latihan kemahiran yang sedia ada. Aktiviti Pembinaan adalah berdasarkan Klasifikasi Perindustrian Piawaian Malaysia 2008 (MSIC 2008) di bawah Seksyen F - Pembinaan, Bahagian 41 – Pembinaan Bangunan. Dokumen ini dibahagikan kepada beberapa bab iaitu, Bab 1 menerangkan objektif dan skop kajian serta justifikasi pemilihan seksyen dan bahagian dalam MSIC 2008 bagi mengklasifikasikan industri pembinaan bangunan. Bab 2 memberi gambaran industri yang menonjolkan definisi dan skop industri, pihak berkepentingan, perundangan, inisiatif dan kecerdasan pasaran. Bab 3 menghuraikan metodologi yang digunakan dalam pembangunan OF termasuk analisis kualitatif melalui sesi perbincangan berkumpulan. Bab 4 membincangkan penemuan dari perbincangan kumpulan fokus yang diterjemahkan ke dalam Struktur Pekerjaan, Deskripsi Pekerjaan, Pekerjaan yang diperlukan, Kemahiran Yang Diperlukan dan Kemahiran Baru Muncul. Akhirnya, Bab 5 menyimpulkan jumlah bidang kerja yang dikenal pasti (16 bidang dengan 128 jawatan pekerjaan dan 48 jawatan pekerjaan kritikal) dan juga mengesyorkan Standard Kemahiran Pekerjaan Kebangsaan (SKPK) atau Standard Keterampilan Kebangsaan (SKK) yang perlu dibangunkan berdasarkan pekerjaan yang mempunyai permintaan di pasaran yang dikenal pasti dalam OF ini bersama kemahiran dalam permintaan serta kemahiran baharu yang perlu dimasukkan dalam standard dan kurikulum latihan SKPK di bawah JPK**.**

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LIST OF ABBREVIATIONS

3D	Dirty, dangerous and difficult
ABM	*Akademi Binaan Malaysia*
BEM	Board of Engineers Malaysia
BQ	Bill of Quantity
CBT	Competency Based Training
CIAST	Centre for Instructor and Advance Skill Training
CIDB	Construction Industry Development Board
CITP	Construction Industry Transformation Programme
COL	Critical Occupational List
DoE	Department of Environment
DOSH	Department of Occupational Safety and Health
DoSM	Department of Statistics Malaysia
DSD	Department of Skills Development
GDP	Gross Domestic Product
IBS	Industrialised Building System
ILP	*Institut Latihan Perindustrian*
IoT	Internet of Things
ISIC	International Standard Industrial Classification
JPK	*Jabatan Pembangunan Kemahiran*
KPKT	*Kementerian Perumahan dan Kerajaan Tempatan*
MIDA	Malaysian Investment Development Authority
MITI	Ministry of International Trade and Industry
MOSQF	Malaysian Occupational Skills Qualification Framework
MoW	Ministry of Works
MQA	Malaysian Qualification Agency
MQF	Malaysian Qualifications Framework
MSIC	Malaysia Standard Industrial Classification
NCS	National Competency Standards
NOSS	National Occupational Skills Standard
OA	Occupational Area
OD	Occupational Description

LIST OF ABBREVIATIONS

OF	Occupational Framework
OS	Occupational Structure
PhD	Doctor of Philosophy
PWD	Public Work Department
QA	Quality Assurance
QC	Quality Control
REHDA	Real Estate and Housing Developers' Association Malaysia
RFIn	Request For Information
SHE	Safety, health and environment
SKK	*Standard Keterampilan Kebangsaan*
SKPK	*Standard Kemahiran Pekerjaan Kebangsaan*
SIRIM	Standard and Industrial Research Institute of Malaysia
SPAN	*Suruhanjaya Perkhidmatan Air Nasional*
TVET	Technical and Vocational Education and Training
UBBL 1984	Uniform Building By Law 1984
USA	United States of America

GLOSSARY

3R	3R (as in letter R) are the basic skills taught in schools: reading, writing and arithmetic.
Construction	Process that consists of building or assembling of infrastructure.
G1 and G2	G1 and G2 are the grade license by the CIDB. G1 can take a project not more that RM200,000 while G2 not more that RM500,000.
Industrialised Building System	IBS is a term used for a technique of construction where components are manufactured in a controlled environment, either at site or off site, placed and assembled into construction works.
Occupational Structure	Distribution of occupations classified according to skill level.
Occupational Framework	Outcome of the occupational analysis process to identify the occupational structure of an industry.

CHAPTER 1: INTRODUCTION

1.1 Introduction

In the Malaysia Standard Industrial Classification 2008 (MSIC 2008), Section F on Construction is expanded into three divisions which are construction of buildings (Division 41), civil engineering (Division 42) and specialized construction activities (Division 43). This occupational framework (OF) focuses on 2 digits MSIC 2008 Division 41: Construction of Buildings. This division includes general construction of buildings of all kinds. It includes new work, repair, additions and alterations of residential and non-residential buildings, the erection of pre-fabricated buildings or structures on the site and also restoration of historical sites and buildings. The construction industry forms one of the largest industries in Malaysia[1]. More than 40,558 companies of all sizes in the construction industry alone are registered under *Suruhanjaya Syarikat Malaysia* (SSM)[2]. In 2017, about 1,330,266 persons are under the employment of this industry. It contributed 4.9 per cent to the GDP in 2018[3]. Despite the revision of mega projects by the government and slowdown in the global construction sector, the total industry indicates a positive growth at 4.2 per cent. To further elaborate on the research into this industry, this chapter will explain the problem statement, objectives and scope of the study as well as justification in the selection of MSIC 2008 Section F, Division 41 for the classification of construction of building industry.

1.2 Problem Statement

The previous analysis on the Occupational Structure (OS) for the construction industry under the Ministry of Human Resources was done in 2015 based on the sectoral

[1] Department of Statistics Malaysia. 2019. Annual Economic Survey 2018- Construction. Page 13
[2] Department of Statistics Malaysia. 2016. Economic Census- Construction. Page 46
[3] Department of Statistics Malaysia. 2018. National Accounts Gross Domestic Product 2015-2018. Page 1

classification of the Industrial Malaysia Planning by MITI. This current research is to align the classification of the industry with MSIC 2008 sections and divisions. In addition, as time progresses, technologies have evolved, new areas may be added and new sets of competences are introduced. Thus, this Occupational Framework aims to align these technological and workplace developments in relation to its occupational structure, critical jobs and competencies in demand.

1.3 Objectives of Study

Generally, the objectives of this study are to propose the OS, job titles, occupational descriptions (OD), competencies in demand and critical skills requirements in the construction of building industry.

Specifically, the objectives of the study are as follows:

a) To establish the OS for MSIC 2008, Section F Division 41: Construction of Buildings;
b) To list the critical jobs in the construction of building industry;
c) To establish the OD for each job title based on the latest industry OS;
d) To examine the competencies in demand in the construction of building industry; and
e) To identify job titles relevant to Industry Revolution 4.0 in the construction of building industry.

1.4 Scope of Study

The scope of work for this study covers the construction of buildings industry in Malaysia. It includes new work, repair, additions and alterations of residential and non-residential buildings, the erection of pre-fabricated buildings or structures on the site and also restoration of historical sites and buildings. Excluded are the construction of civil engineering structures such as roads, railway tracks, bridges, tunnels and other utility projects (Division 42). Specialized construction activities (Division 43) such as foundation work, scaffolding and building completion are also excluded. Both qualitative and quantitative methodologies will be employed through document analysis, focus group

discussion and survey. The scope of this research covers peninsular Malaysia, Sabah, Sarawak and Labuan. The respondents of this study are limited to those working with the construction of buildings industry registered with SSM. In the Economic Census 2016, it is reported that there are about 15,857 companies registered under 2 digits MSIC 2008, Division 41: Construction of Buildings.

1.5 Justification for Malaysia Standard Industrial Classification 2008 (MSIC 2008) Section Selection

MSIC 2008 is based on the International Standard Industrial Classification 2008 which is applied in industries worldwide. MSIC 2008 is provided by the Department of Statistics Malaysia (DoSM) to classify the industry sectors in Malaysia and produce industry economic statistics.–Building construction refers to the process and techniques involved in the assembly and erection of structures, primarily those used to provide shelter. The scope of construction of buildings industry thus matches the descriptions specified in MSIC 2008 Section F, Division 41: Construction of Buildings. It includes new work, repair, additions and alterations, the erection of pre-fabricated buildings or structures on the site and also construction of temporary nature. This division also includes the construction of entire dwellings, office buildings, stores and other public and utility buildings, and farm buildings.

1.6 Structure of Chapter

This chapter concludes with a brief overview of the entire study which includes:

a) Chapter 1

   This chapter provides an introduction to 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 41: Construction of Buildings as the basis for classification.

b) 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), Department of Statistics Malaysia (DoSM) and also from other local and international related sources.

c) Chapter 3

This chapter describes the overall approach and methods deployed to achieve the objectives of the study such as focus group discussion with experts from the construction of buildings industry, survey from companies related to the industry and document analysis based on published information.

d) Chapter 4

This chapter collates all the results and findings of the research on construction of buildings obtained based on the objectives of the study.

e) 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.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the current scenario of the construction of buildings industry in Malaysia, related government bodies and professional associations, related legislation and acts, government policies and development plans as well as the industry competitiveness at international level.

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

2.1.1 National Skills Development Act 2006 (Act 652)

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

five (5) levels of national skills qualification, namely Malaysian Skills Certificate Level 1, 2 and 3; Malaysian Skills Diploma; and Malaysian Skills Advanced Diploma[4].

2.1.2 Malaysian Qualification Framework (MQF)

The Malaysian Qualification Framework (MQF) refers to the policy framework that satisfies both the nationally and internationally recognised qualifications. It comprises of titles and guidelines, together with the principles and protocols covering articulation and issuance of qualifications and statements of attainment. Elements of qualification framework indicate the achievements for each qualification title. It will also provide progression routes for all the graduates in the respective occupational fields.

The MQF 2nd Edition has eight levels of qualification in two sectors supported by lifelong education pathways as shown in Table 2.1. The Department of Skills Development (DSD) governs the skills sector, in which there are five (5) levels of skills qualification. The definition for each level of skills qualification is specified in the Malaysian Occupational Skills Qualification Framework (MOSQF) and can be referred in Annex 1[5].

Table 2.1 Malaysian Qualification Framework (MQF) Chart
(Source: Malaysian Qualification Framework 2nd Edition)

MQF Level	Minimum Graduating Credit	Academic Sector	TVET Sector	Lifelong 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		

[4] National Skills Development Act 652 (2019, August 27). Retrieved from http://www.agc.gov.my/agcportal/index.php
[5] Malaysian Qualification Agency. 2018. Malaysian Qualification Framework 2nd Edition.

MQF Level	Minimum Graduating Credit	Academic Sector	TVET Sector	Lifelong Learning/APEL Criteria for APEL(A)
7	No credit rating	Master's by Research		Admission criteria: 30 years old STPM/Diploma/equivalent Relevant work experience Passed APEL assessment
	40	Master's by Mixed Mode & Coursework		
	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

2.1.3 Occupational Framework (OF)

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

The development of the OF is a preliminary process in developing relevant NOSS. Once developed, the NOSS can be used as the basis to conduct skills training and skills certification of competent personnel[6].

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

The National Occupational Skills Standard (NOSS) is a standard document that outlines the minimum competencies required by a skilled worker working in Malaysia for a particular area and level of occupation. It also describes the pathway to achieve the competencies and is gazetted in Part IV of the National Skills Development Act 652. NOSS is developed by the sector experts based on the needs of the sector and is utilised as the main tool in the implementation of the Malaysian Skills Certification System. Under this system, the performance of existing sector workers and trainees are assessed based on the respective NOSS for the awarding of Malaysian Skills Certificate[7]. Meanwhile, the National Competency Standard (NCS) describes the knowledge, skills and attitudes needed to perform in a particular occupation that does not directly relate to any particular job classification.

2.1.5 Competency Based Training (CBT)

Competency Based Training (CBT) is an approach to vocational training which emphasises on what a person can do in a work place as a result of education and training

[6] Department of Skill Development (2019, August 27). Retrieved from https://www.dsd.gov.my/jpkv4/index.php/my/
[7] National Skills Development Act 652 (2019, August 27). Retrieved from http://www.agc.gov.my/agcportal/index.php

obtained. CBT is based on performance standards which are set by the sector with the main focus on measuring the performance while considering knowledge and attitude rather than the duration taken to complete the course. CBT is a learner-centric and outcome-based approach to training which allows individuals to develop skills at their own pace for a similar outcome. Thus, training practices can be customised for each individual to achieve a similar outcome. The CBT concept is the basis of Malaysian Skills Certification system which is coordinated by DSD[8].

2.2 Scope of Occupational Framework Based on MSIC 2008

This section provides the detailed scope of MSIC 2008 on construction of buildings industry. The definition of MSIC 2008 and title selection criteria are explained in this section.

2.2.1 Malaysia Standard Industrial Classification 2008 (MSIC 2008) Definition

The MSIC 2008 is intended to be a standard classification of productive economic activities. Its main purpose is to provide a set of activity categories that can be utilised for the collection and presentation of statistics according to such activities. Therefore, MSIC 2008 aims to present this set of activity categories in such a way that entities can be classified according to the economic activity that they carry out. For purposes of international comparability, the MSIC 2008 Version 1.0 conforms closely to the International Standard Industrial Classification of All Economic Activities (ISIC) Revision 4, published by the United Nations Statistics Division, with some modifications to suit national requirements. The objective of an industrial classification system is to classify data in respect of the economy according to categories of activities and the characteristics of which will be similar. The MSIC 2008 is a classification of all types of economic activities and is not a classification of goods and services nor is it a classification of occupations[9].

[8] Department of Skill Development (2019, August 27). Retrieved from https://www.dsd.gov.my/jpkv4/index.php/my/

[9] Department of Statistics Malaysia. (2008). Malaysia Standard Industrial Classification 2008 Ver. 1.0.

2.2.2 Title Selection Criteria

This research area is focusing on the construction of buildings industry. As stated earlier the definition of the research area is aligned with MSIC 2008. Based on MSIC 2008, the definition and scope of coverage for the OF is as follows in Table 2.2.

Table 2.2: Summary of MSIC 2008 by Section, Division and Group
(Source: MSIC 2008)

Section	**F**	**Construction**
Division	**41**	**Construction of buildings**
Group	**410**	**Construction of buildings**

Table 2.3 below is an excerpt taken from MSIC 2008 to illustrate the scope of this Occupational Framework.

Table 2.3: Description of MSIC 2008 by Section, Division, Group, Class and Item
(Source: MSIC 2008)

CLASSIFICATION	CODE	DESCRIPTION
Section	**F**	**Construction**
Division	**41**	**Construction of buildings** This division includes the general construction of buildings of all kinds. It includes new work, repair, additions and alterations, the erection of pre-fabricated buildings or structures on the site and also construction of temporary nature. Included is the construction of entire dwellings, office buildings, stores and other public and utility buildings, farm buildings, etc.
Group	**410**	**Construction of buildings**

CLASSIFICATION	CODE	DESCRIPTION
		This group includes the construction of complete residential or non-residential buildings, on own account for sale or on a fee or contract basis. Outsourcing parts or even the whole construction process is possible. If only specialized parts of the construction process are carried out, the activity is classified in Division 43.
Class	**4100**	**Construction of buildings** **Includes:** a) Remodelling or renovating existing residential structures b) Construction of complete residential or non-residential buildings, on own account for sale or on a fee or contract basis **Excludes:** a) Erection of complete prefabricated constructions from self-manufactured parts not of concrete, see Divisions 16 and 25 b) Construction of industrial facilities, except buildings, see 4290 c) Architectural and engineering activities, see 7110 d) Project management activities related to construction, see Division M 71102
Item	**41001**	**Residential buildings** Includes construction of all types of residential buildings: single-family houses (e.g. bungalows);

CLASSIFICATION	CODE	DESCRIPTION
		multi-family buildings (e.g. terraces, apartments and condominiums), including high-rise buildings
	41002	**Non-residential buildings** Includes construction of all types of non-residential buildings (e.g. buildings for industrial production; hospitals, schools, office buildings; hotels, stores, shopping malls, restaurants; airport buildings; indoor sports facilities; parking garages; warehouses; religious buildings, etc.)
	41003	**Assembly and erection of prefabricated constructions on the site**
	41009	**Construction of buildings n.e.c.** Includes restoring of historical sites and buildings

2.3 Key Stakeholders

The key stakeholders for the construction of buildings industry in Malaysia comprise of government agencies, regulatory bodies, industry associations and professional bodies. Stakeholders defined as a person, group or organisation that has interest or concern in an organisation. Stakeholders can affect or be affected by the organisation's action, objectives and policies.

2.3.1 Government Agencies and Regulatory Bodies

Table 2.4 lists the Government Agencies that are empowered by the legislations according to the scope and powers given in the related acts that directly regulate the construction of buildings industry in Malaysia.

Table 2.4: List of Government Agencies and Regulatory Bodies for Construction of Buildings Industry

NO.	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
1.	Ministry of Housing and Local Government	The Ministry of Housing and Local Government (*Kementerian Perumahan dan Kerajaan Tempatan*), abbreviated KPKT, is a ministry of the Government of Malaysia that is responsible for urban well-being, housing, local government, town planning, country planning, fire and rescue authority, landscape, solid waste management, strata management, moneylenders and pawnbrokers[10]. The Ministry of Housing and Local Government is responsible for the administration of several key Acts: a) Housing i) Housing Development (Control and Licensing) ii) Building and Common Property (Maintenance and Management) iii) Strata Management b) Local Government i) Local Government ii) Street, Drainage and Building c) Solid Waste Management and Public Cleansing i) Solid Waste and Public Cleansing Management Solid Waste and Public Cleansing Management Corporation d) Town and Country Planning i) Town and Country Planning

[10] Ministry of Housing and Local Government. (2019, August 27). Retrieved from http://www.kpkt.gov.my/index.php/

NO.	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
		ii) Town Planners e) Fire and Rescue Authority i) Fire Services
2.	The Ministry of Works Malaysia	The Ministry of Works (MoW) was formed in 1956 and has changed names several times since then until the Government decided to rename 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: 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[11].
3.	Construction Industry Development Board (CIDB)	The Construction Industry Development Board was established under the Construction Industry Development Board Act 1994 (Act 520) to regulate, develop and facilitate the construction industry towards achieving global competitiveness.

[11] Ministry of Work. (2019, August 27). Retrieved from http:// http://www.kkr.gov.my/en/history/

NO.	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
		The Board advises the Federal and the State Governments, as well as other stakeholders on matters affecting or connected with the construction industry[12].
4.	Department of Occupational Safety and Health (DOSH)	The Department of Occupational Safety and Health (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].
5.	Department of Environment	Established in 1975, the Department of Environment (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 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].
6.	*Suruhanjaya Perkhidmatan Air Negara*	*Suruhanjaya Perkhidmatan Air Negara* or the Water Services Commission (SPAN) is a technical and economic regulatory body for the water supply and

[12] CIDB (2019, August 27). Retrieved from http://www.cidb.gov.my/index.php/my/info-korporat/fungsi
[13] DOSH (2019, August 27). Retrieved from http://www.dosh.gov.my/index.php/en/about-us/dosh-profile
[14] DoE (2019, August 27). Retrieved from https://www.aecen.org/malaysia-department-environment

NO.	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
		sewerage services in Peninsular Malaysia and Federal Territories of Putrajaya and Labuan. The Commission regulates all entities in the water supply and sewerage services industry in accordance to the Water Services Industry Act 2006 (Act 655) which was enforced on 1 January 2008[15].
7.	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 main focus of the commission are 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[16].
8.	SIRIM Berhad	SIRIM Berhad, formerly known as the Standard and Industrial Research Institute of Malaysia (SIRIM), is a corporate organisation wholly owned by the Malaysian Government, under the Minister of Finance Incorporated. It has been entrusted by the Malaysian Government to be the national organisation for standards and quality, and as a

[15] National Water Services Commission (2019, August 27). Retrieved from https://www.span.gov.my/article/view/the-commission-s-role
[16] Energy Commission (2019, August 27). Retrieved from https://www.st.gov.my/details/aboutus/1

NO.	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
		promoter of technological excellence in the Malaysian industry[17].

2.3.2 Industry Associations and Professional Bodies

This section covers the activities of various industry associations and professional bodies related to the construction of buildings. The scope of review covers professional services that are provided to the building industry. Regulations of these professional services will add value to the building construction industry and ultimately to the whole economy. Industry associations and professional bodies related to construction of buildings industry are listed in Table 2.5.

Table 2.5: List of Related Industry Associations and Professional Bodies for Construction Industry

NO.	ORGANISATIONS	OVERVIEW, ROLES FUNCTIONS AND RESPONSIBILITIES
1.	Board of Engineers Malaysia (BEM)	The Board of Engineers Malaysia (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

[17] SIRIM Berhad (2019, August 27). Retrieved from http://www.sirim.my/about-us.html

NO.	ORGANISATIONS	OVERVIEW, ROLES FUNCTIONS AND RESPONSIBILITIES
		registered person in order to safeguard the safety and interest of the public[18].
2.	Board of Architects Malaysia	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 the Section 4(1) of the aforesaid Act which includes the following: 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[19].
3.	The Board of Quantity Surveyors Malaysia	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: 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

[18] Board of Engineers Malaysia (2019, August 27). Retrieved from http://www.bem.org.my/web/guest/history

[19] Board of architects Malaysia (2019, August 27). Retrieved from https://www.lam.gov.my/index.php/board-of-architects-malaysia/board-of-architects-malaysia.html

NO.	ORGANISATIONS	OVERVIEW, ROLES FUNCTIONS AND RESPONSIBILITIES
		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[20].
4.	The Heritage of Malaysia Trust	The Heritage of Malaysia Trust (*Badan Warisan Malaysia*) is the leading national heritage NGO with a reputation for excellence in heritage conservation services spanning over 30 years. As an independent registered charity, its role is to raise awareness of heritage issues and advocate for a conservation-friendly environment in Malaysia[21].
5.	Real Estate and Housing Developers' Association Malaysia (REHDA)	REHDA is recognized as the leading representative body for private property developers, being involved primarily in advocacy and governance. Its members are involved in all types of property development, from traditional housing projects to condominiums, townships, towering commercial complexes, shopping malls, state-of-the-art golf courses, hospitals, theme parks and industrial estates.

[20] BQSM (2019, August 27). Retrieved from https://www.bqsm.gov.my/index.php/en/about-us/functions
[21] Malaysia heritage trust (2019, August 27) retrieved from https://badanwarisanmalaysia.org/about-us-2/our-story/

NO.	ORGANISATIONS	OVERVIEW, ROLES FUNCTIONS AND RESPONSIBILITIES
		Being the sole national representative body for property developers, REHDA plays a pivotal role in ensuring that developers' views are heard by the relevant authorities and government agencies. REHDA is highly regarded by both the public and private sectors for its commitment to nation building and betterment of life through sustainable property development[22].

2.3.3 Training Centres

This section provides information regarding available training centres in Malaysia that provide training related to construction of building. The five main training centres are listed in Table 2.6.

Table 2.6: Training Centres Offering Courses in Construction

NO.	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
1.	*Akademi Binaan Malaysia*	*Akademi Binaan Malaysia* or the Malaysian Academy of Buildings (ABM) 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:

[22] REHDA (2019, August 27) retrieved from http://rehda.com/about/#AboutREHDA

NO.	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
		a) Construction Skills Competency Training Programme (for youths and existing construction workers) b) Construction Skills Competency Assessment c) Customised Programmes d) Safety and Health Induction Course for Construction Workers (SICW) (Green Card) e) Construction Certification Programme f) Continuing Professional Development[23].
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 work force 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[24]. Courses related to construction of buildings include *Teknologi Bangunan, Seni Landskap dan Taman*, and Building Maintenance.
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 *Kolej Kemahiran Tinggi MARA*, MARA-Japan Industrial Institute and *Institusi Kemahiran MARA*. Courses related to construction of buildings include

[23] Akademi Binaan Malaysia (2019, August 27). Retrieved from https://www.akademibinaan.com.my/abmweb/index.php/mengenai-abm/tentang-abm
[24] GIATMARA (2019, August 27). Retrieved from http://giatmara.edu.my

NO.	ORGANISATIONS	OVERVIEW, ROLES, FUNCTIONS AND RESPONSIBILITIES
		Certificate in Building Technology, Certificate in Building Engineering Technology, Diploma in Construction Technology (in various specialisations) and Diploma in Building Engineering Technology (in various specialisations)[25].
4.	*Institut Latihan Perindustrian*	*Institut Latihan Perindustrian* or the Industrial Training Institute (ILP) is a training institute for the production of 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 construction of buildings include *Sijil Binaan Bangunan* and *Diploma Binaan Bangunan*.
5.	*Institut Kemahiran Belia Negara*	*Institut Kemahiran Belia Negara* or the National Youth Skills Institute (IKBN) is a skill-based institution under the auspices of the Ministry of Youth and Sports Malaysia. Courses on building construction include *Sijil Teknologi Awam – Binaan Bangunan, Sijil Teknologi Awam –Penyelenggaraan Bangunan, Sijil Lanjutan Teknologi Awam – Binaan Bangunan* and *Diploma Teknologi Awam (Sivil & Struktur)*[26].

[25] TVET MARA (2019, August 27). Retrieved from http://www.tvetmara.edu.my/en/index.php/information-on-kktm-mjii-ikm

[26] Bahagian Pembangunan Kemahiran Belia institusi Latihan Kemahiran Belia & Sukan (2019, August 27) Retrieved from http://kemahiran.kbs.gov.my/ms/teknologi-awam.html

2.4 Government Legislations, Policies and Initiatives

It is imperative that this research has to refer to legislations, by-laws and policies that are directly related to the construction of building industry.

2.4.1 Government Legislations

The following legislations are relevant to the construction of building industry in Malaysia;

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

An Act to amend and consolidate the laws relating to street, drainage and building in local authority areas in Peninsular Malaysia, and for purposes connected therewith. In general, the Act is divided into 8 sections comprising provisions on roads, trenches, buildings, back alleys, various, by-laws and the abolition and transitional provisions resulting in a total of one hundred and thirty-five (135) sections therein.

Uniform Building by Law also known as UBBL 1984, a subsidiary law under the Street Drainage and Building Act 1974 (Act 133) is a building code which provides the minimum requirements for the control and construction of street, drainage and building in local authorities' areas. There are 9 parts to the building code which include 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. UBBL 1984 is gazetted by each state to be adopted and enforced by the local authorities in a state. For Kuala Lumpur, Labuan and Putrajaya the relevant state authority is the Ministry of Federal Territory[27].

[27] UBBL 1984 (2019, August 25) retrieved from www.mpc.gov.my › wp-content › uploads ›2016/04 ›Chapter-4

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

Occupational Safety and Health Act 1994 was gazetted by the Malaysian parliament on 25 February 1994.
The objectives of this Act are:

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[28].

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 person 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 factory, and registration and use of machinery

[28] OSHA 1994 (2019, August 25). Retrieved from http://www.dosh.gov.my/index.php/en/legislation/regulations-1/osha-1994-act-154

vi) General[29].

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[30].

e) The Quantity Surveyors Act 1967 (Act 487)

This Act to provides for the establishment of the Board of Quantity Surveyors, for the registration of Quantity Surveyors and approval to practise of firms or corporate bodies practising as consulting Quantity Surveyors, for the regulation of the practice of quantity surveying and for matters connected[31].

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

An act to provide for the establishment of the Construction Industry Development Board (*Lembaga Pembangunan Industri Pembinaan Malaysia*) 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.

The amendment encompasses three main areas:

[29] Factory and Machinery act 1967 (2019, August 25). Retrieved from http://www.dosh.gov.my/index.php/en/legislation/regulations-1/regulations-under-factories-and-machinery-act-1967-act-139

[30] Federal Road acts 1959 (2019, August 25). Retrieved from http://www.commonlii.org/my/legis/consol_act/fra19591989192/

[31] Quantity surveyor act (2019, August 25). Retrieved from https://www.bqsm.gov.my/index.php/en/qs-act

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
iii) Contractors and site managers' responsibility to ensure safety of buildings during or after the construction work[32].

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 provides for the registration of architects, sole proprietors, partnerships and corporate bodies providing architectural consultancy services, and building draughtsmen and matters connected therewith.

2.4.2 Government Policies and Initiatives

This section provides information regarding related government policies and initiatives for construction of building industry in Malaysia. There are 3 policies identified related to the construction of buildings in Malaysia.

a) Construction Industry Transformation Programme (CITP)

The CITP is Malaysia's national agenda to transform the construction industry from 2016 to 2020. It aims to accelerate the development of the Malaysian construction industry and prepare it to meet the future demands of the economy. The Ministry of Works, collaborating with its agencies and more specifically, the CIDB has spearheaded the development of this Construction

[32] CIDB act 520 (2019, August 25) retrieved from http://www.cidb.gov.my/index.php/en/legislation/act-520

Industry Transformation Programme. Given the strong interdependencies between construction and the other sectors in the economy, this transformation of the construction industry will engage the joint effort of stakeholders across government ministries and agencies, industry players, professional boards and associations, universities and research organisations. A wide range of stakeholders has therefore been involved in the development of the CITP, as their input and support for implementation are critical for the CITP to be successful. Four strategic thrusts have been identified to guide the transformation and continued development of the construction industry and to address the issues mentioned above: Quality, Safety and Professionalism, Environmental Sustainability, Productivity and Internationalisation.

b) Industrialised Building System Initiative

In an effort to move away from labour intensive activities, CIDB has initiated to industrialise the industry with Industrialised Building System (IBS). This initiative aims to produce and deliver high quality and value for money products as well as to ensure the industry stays competitive. IBS offers technology-intensive construction techniques where components are manufactured in a controlled environment, either at site or off-site, which are then placed and assembled into construction works. CIDB establishes the IBS Centre as a one-stop reference centre that houses the IBS Info Gallery, IBS Component Gallery, IBS Show Village and IBS Testing Facilities (*Makmal Kerja Raya Malaysia).*

c) Work Distribution Policy to Class G1 and G2

The Ministry of Public Works has introduced a 10% Distribution Policy to Class G1 (formerly known as Class F) contractors for projects worth RM10 million and above beginning in 2008. However, this policy was suspended on 7 May, 2009, and further improved and extended to Class G2 (formerly known as Class E) contractor in 2010. Known as Work Distribution Policy to Class G1 and G2 (Bumiputera) and implemented through the allocation of money

while in the tender documents for projects worth RM 10 million and above, this policy aims to provide more job opportunities to the contractors of Class G1 and G2 in view of the large number of those contractors. In addition, the implementation of this policy will also provide exposure to Class G1 and G2 contractors in order to be involved in the implementation of large projects while increasing their skill level in the construction industry[33].

2.5 Industry and Market Intelligence

Industry and market intelligence are the collection and analysis of data of an industry by various sources of data to be utilised by the industry to make business decisions, manpower developments and training requirements. Industry intelligence is critical for developing strategies in the development of the industry, areas of manpower development and the impact of those developments. This section will provide information regarding construction of buildings industry based on industry growth and employment statistics.

2.5.1 Growth of Construction of Buildings Industry

Based on the National Account Gross Domestic Product 2015-2018, Malaysia's economy grew by 4.7 per cent in 2018 compared to the previous year, 2017 at 5.7 per cent[34]. Malaysia Gross Domestic Product (GDP) in 2018 recorded RM1,361.5 billion where the main contributors come from services and manufacturing sectors with 56.7 per cent and 22.4 per cent respectively. Meanwhile, the main influencer for expenditure was driven by the Private Final Consumption Expenditure.

This research focussed on construction of buildings industry. The percentage share to Malaysia GDP by the construction sector recorded a share of 4.7 per cent in 2015, 4.8 percent in 2016 and 4.9 per cent in both 2017 and 2018[35]. For construction of buildings the percentage share is the sum of contributions from the construction of residential and

[33] Work Distribution Policy to Class E and F (2019, August 27). Retrieved from http://www.kkr.gov.my/en/node/18320
[34] Department of Statistics Malaysia. 2019. National Account Gross Domestic Product 2018. Page 1
[35] Department of Statistics Malaysia. 2019. National Account Gross Domestic Product 2018. Page 46

non-residential buildings. The value decreased from 2.6 per cent in 2015 to 2.5 per cent in both 2016 and 2017 to 2.3 per cent in 2018[36].

For the annual percentage change of construction industry from 2016 to 2018, it can be seen that it is slightly decreasing in terms of per cent by year. In 2016, the annual percentage change for the construction industry is 7.4 per cent and decreased throughout the year to 4.9 per cent in 2017 and 7.3 per cent in 2018[37].

2.5.2 Employment Statistics

This section provides an overview regarding labour force, labour demand in Malaysia and employment statistics of construction of buildings industry.

a) Labour Force in Malaysia

Labour force can be defined as the sum of persons in employment plus persons in unemployment. Together these two groups of the population represent the current supply of labour for the production of goods and services taking place in a country through market transactions in exchange for remuneration[38]. The concept and definition of labour force in Malaysia are stated in Figure 2.1 below.

[36] Department of Statistics Malaysia. 2019. National Account Gross Domestic Product 2018. Page 46
[37] Department of Statistics Malaysia. 2019. National Account Gross Domestic Product 2018. Page 38
[38] International Labour Organization. 2018. Labour force (2019, 30 September) Retrieved from https://www.ilo.org/global/statistics-and-databases/statistics-overview-and-topics/WCMS_470304/lang--en/index.htm

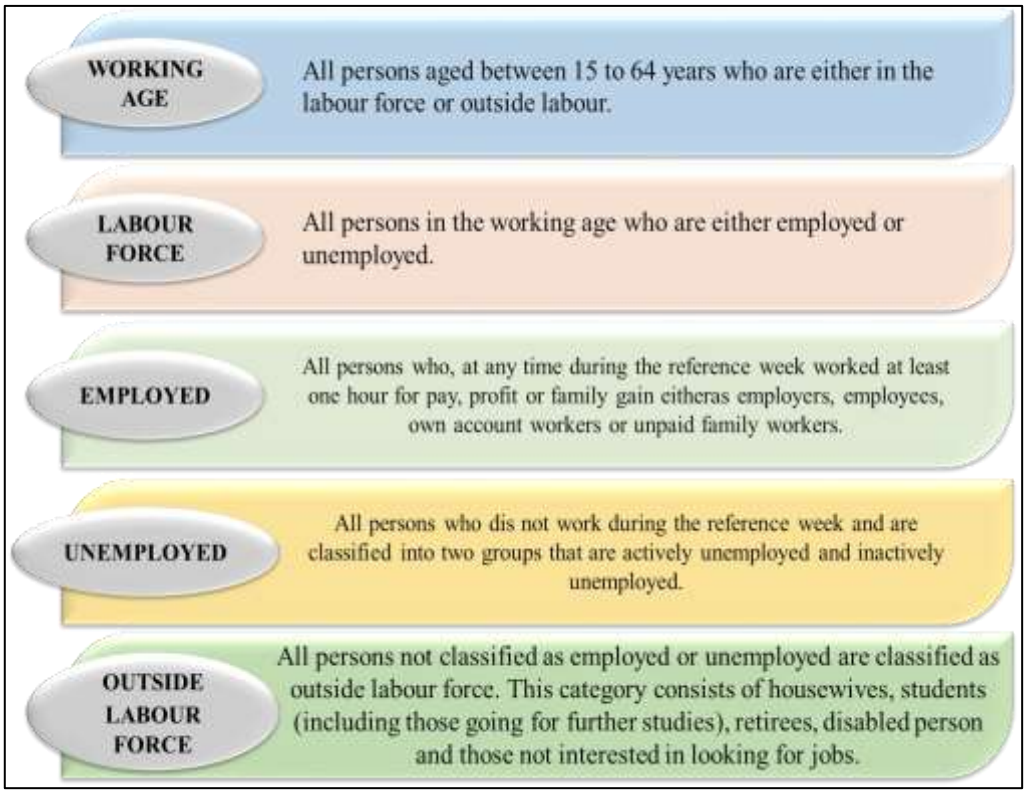

Figure 2.1: Concepts and Definitions Relating to Labour Force in Malaysia
(Source: Department of Statistics Malaysia, 2019)

Labour force in Malaysia increased by 2.0 per cent from 15.0 million persons in 2017 to nearly 15.3 million persons in 2018. The increment in labour force was contributed by 299,200 employed persons. Labour force participation rate (LFPR) in 2018 increased by 0.3 percentage points to 68.3 per cent as compared to 2017 which is 68.0 per cent[39]. Hence, the remaining 31.7 per cent of the working age population was outside the labour force. On the other hand, the unemployment rate improved to 3.3 per cent in 2018 as compared to 3.4 per cent in 2017. This shows that the country's economy is still operating with full employment where the unemployment rate is below 4.0 per cent.

b) Overview of Construction Sector Labour Demand

Labour demand indicates the total labour that the economy is willing to employ at any given point of time. At the microeconomic level, labour demand by firm

[39] Department of Statistics Malaysia. 2019. The Labour Force Survey Report 2018. Page 12

refers to positions in the company; and through the process of hires and separations, the information of filled positions and vacancies can be estimated. The concepts and definitions of the statistics on labour demand in this publication are as in Figure 2.2.

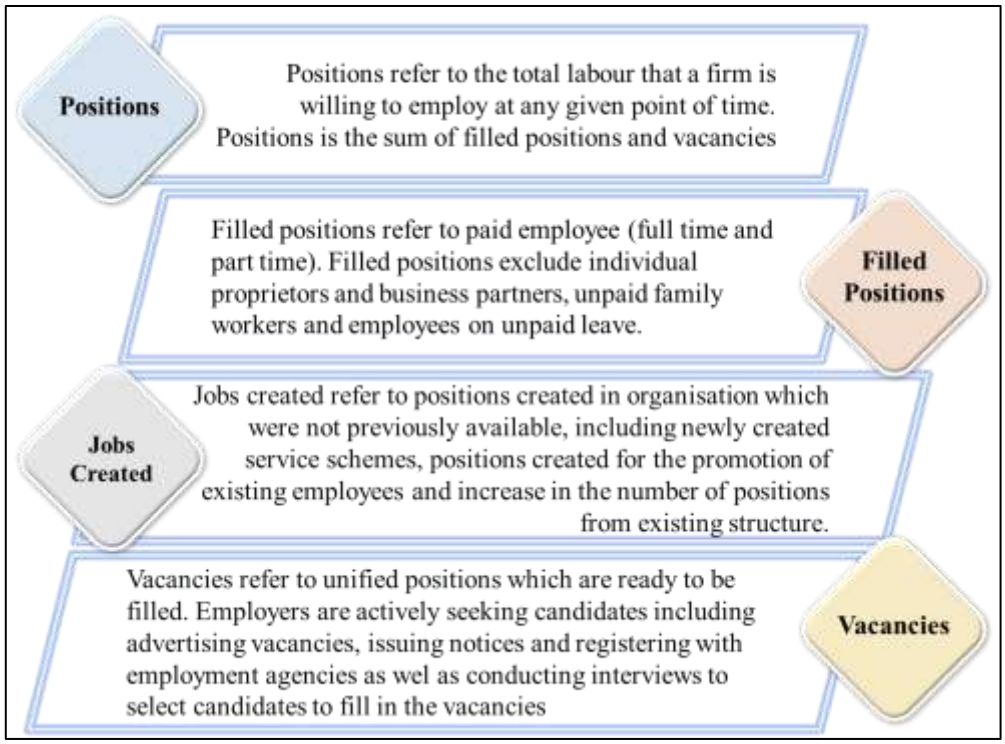

Figure 2.2: Concepts and Definitions Relating to Labour Demand
(Source: Department of Statistics Malaysia, 2019)

In 2018, the construction sector posted 1,313,000 positions, dropped 13,000 as against 1,326,000 in 2017. The number of filled positions decreased to 1,291,000 (2017: 1,304,000) while vacancies in this sector was 21,000 (2017: 22,000). Meanwhile in 2018, there were 20,000 jobs created in the construction sector[40]. The detailed information can be referred in Figure 2.3.

[40] Department of Statistics Malaysia. 2019. Employment Statistics Second Quarter 2019. Page 12

Figure 2.3: Employment statistics in construction

(Source: Department of Statistics Malaysia, 2019)

Based on Malaysia Standard Classification of Occupation (MASCO) 2013, the workers are categorised into three which are skilled workers, semi-skilled workers and low skilled workers. Skilled workers are employed persons in the occupation categories of managers, professionals, technicians and associate professionals. While semi-skilled workers are employed persons in the occupation categories of clerical support workers, services and sales workers, craft and related trade workers. Besides that, the low skilled workers are the persons in the elementary occupations.

For positions by skill in the construction sector by percentage share for 2018, 84.3 per cent was recorded for semi-skilled workers, 11.8 per cent for skilled workers and 3.9 per cent for low skilled workers[41]. As compared to 2017, the numbers of low skilled workers, semi-skilled workers and skilled workers for positions and skills in the construction sector by percentage share remain the same. The details of the information can be referred to in Figure 2.4.

[41] Department of Statistics Malaysia. 2019. Employment Statistics Second Quarter 2019. Page 32

Figure 2.4: Positions by Skill Level in the Construction Sector by Percentage Share

(Source: Department of Statistics Malaysia, 2019)

For filled positions by skill in the construction sector by percentage share in 2018, 84.8 per cent was recorded for semi-skilled workers, 11.6 per cent for skilled workers and 3.6 per cent for low skilled workers[42]. The comparison with 2017 can be referred to in Figure 2.5.

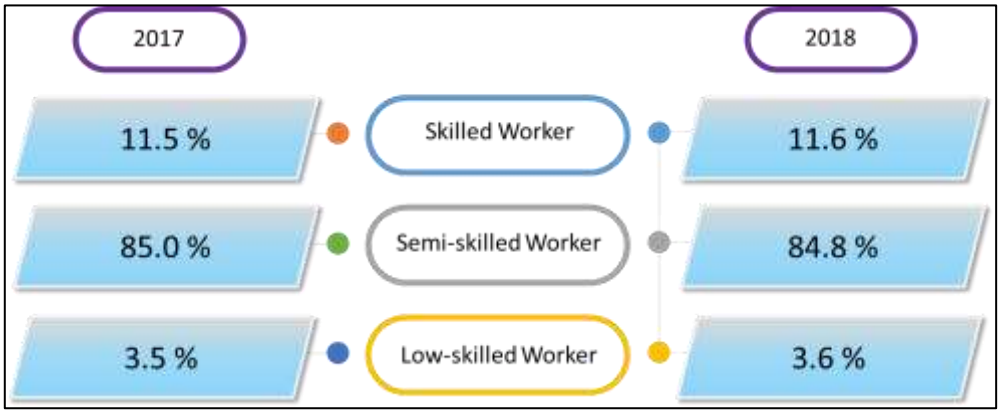

Figure 2.5: Filled Positions by Skill Level in the Construction Sector by Percentage Share

(Source: Department of Statistics Malaysia, 2019)

On the other hand, for vacancies by skill in construction sector by percentage share for 2018, 50.8 per cent was recorded for semi-skilled workers,

[42] Department of Statistics Malaysia. 2019. Employment Statistics Second Quarter 2019. Page 39

25.5 per cent for skilled workers and 23.7 per cent for low skilled workers[43]. The comparison with 2017 can be referred to in Figure 2.6.

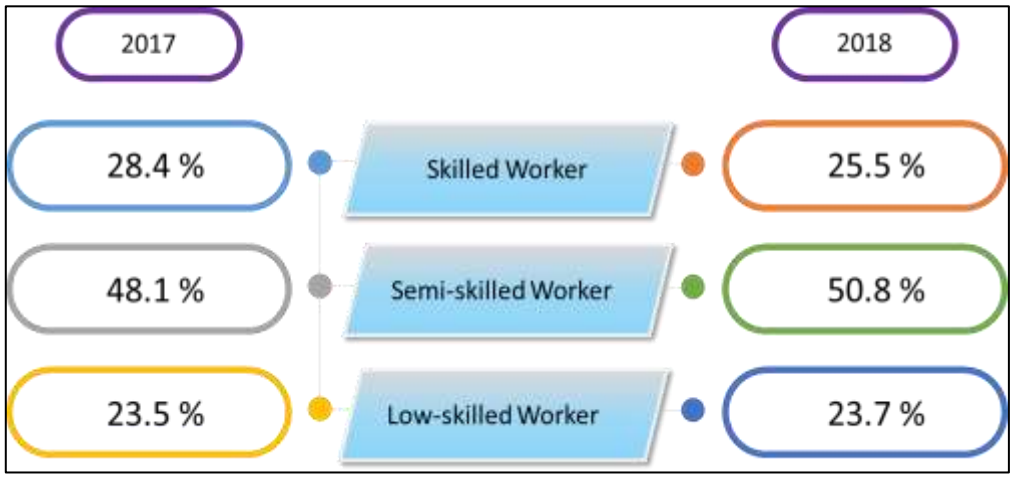

Figure 2.6: Vacancies by Skill Level in the Construction Sector by Percentage Share

(Source: Department of Statistics Malaysia, 2019)

Last but not least, for jobs created by skill in the construction sector by percentage share for 2018, 58.1 per cent was recorded for semi-skilled workers, 37.5 per cent for skilled workers and 4.4 per cent for low skilled workers[44]. The comparison with 2017 can be referred to in Figure 2.7.

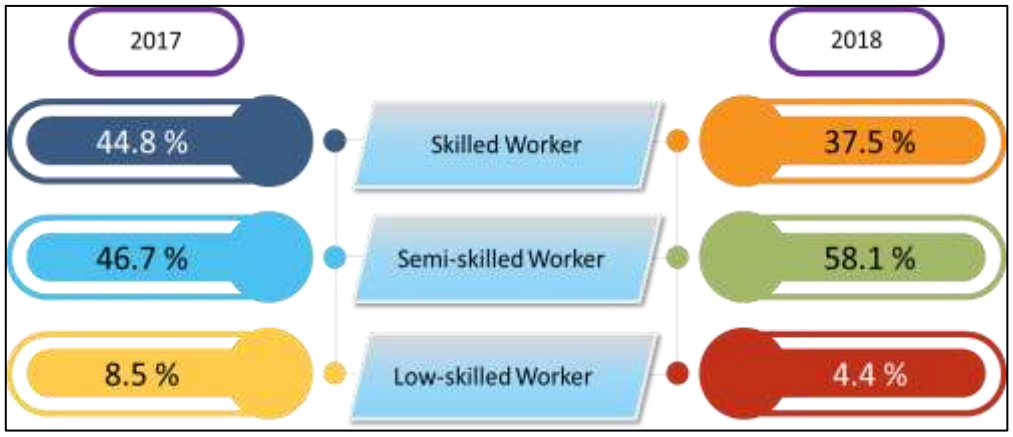

Figure 2.7: Jobs Created by Skill Level in the Construction Sector by Percentage Share

(Source: Department of Statistics Malaysia, 2019)

[43] Department of Statistics Malaysia. 2019. Employment Statistics Second Quarter 2019. Page 44
[44] Department of Statistics Malaysia. 2019. Employment Statistics Second Quarter 2019. Page 51

c) Employment Growth of Construction of Buildings Industry

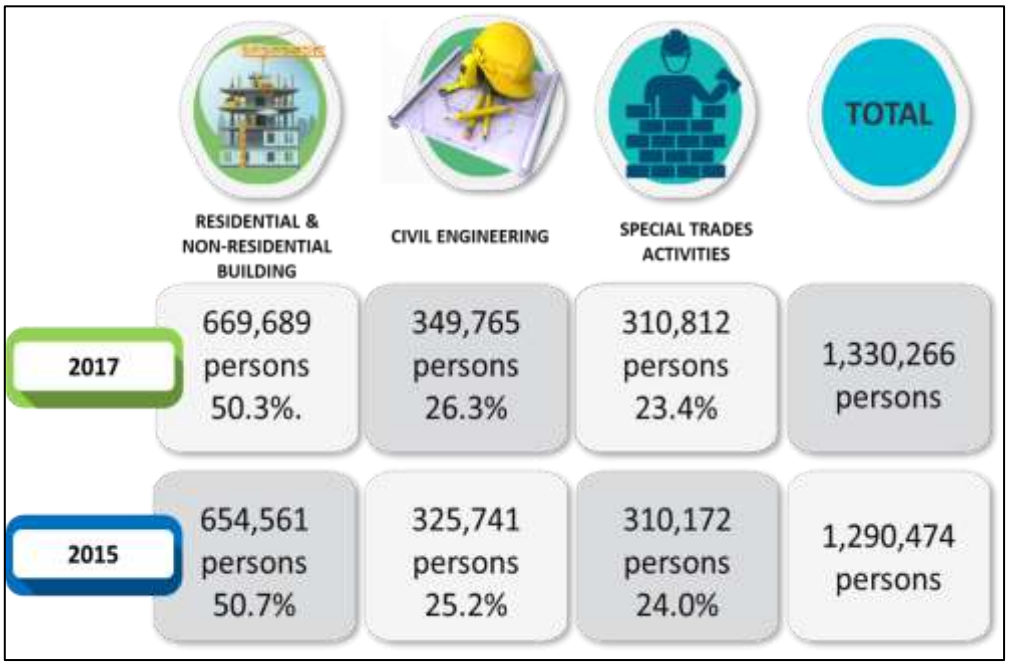

Figure 2.8: Number of Persons Engaged in the Construction Industry by Sub-Sector, 2015 and 2017, Malaysia
(Source: Department of Statistics Malaysia, 2018)

Figure 2.4 shows the number of persons engaged by sub-sector for 2015 and 2017 where it can be seen here that the highest number of persons engaged came from the residential buildings and non-residential buildings sub-sector with a total of 669,689 persons or 50.3 per cent (2015: 50.7%). The second highest contributor was civil engineering sub-sector with 349,765 persons or 26.3 per cent (2015: 25.2%). This was followed by special trades sub-sector which recorded 310,812 persons or 23.4 per cent (2015: 24.0%)[45].

[45] Department of Statistic Malaysia (DoSM). (2018). Annual Economic Statistic 2018

2.5.3 Conclusion

In conclusion for the construction of buildings industry, from 2015-2018, the contribution of this industry towards the Malaysia GDP is decreasing by year with 2.3 per cent in 2018 compared to 2.5 per cent in 2017.

For employment statistics, construction of buildings is the largest contributor for the number of persons engaged with the industry with 669,689 persons. The growth of this industry clearly shows that construction of buildings industry is one of the potential industries to enhance the nation's development in the future.

2.6 Existing NOSS Relevant to MSIC 2008 Section F, Division 41

The Department of Skills Development has developed 35 NOSS related to Division 41, as of January 2019. The summary of NOSS titles is provided in Table 2.7 below.

Table 2.7: Summary of NOSS Developed Under Division 41
(Source: NOSS Registry January 2019)

MSIC GROUP	CORRESPONDING NOSS/ LEVEL
410 Construction of buildings	1) CVS3 (2002) Civil & Structural Supervisor 2) CVS4 (2002) Civil & Structural Manager 3) ARB3 (2002) Architectural & Building Supervisor 4) ARB4 (2003) Architectural & Building Manager 5) MCE3 (2002) Mechanical & Electrical Supervisor 6) MCE4 (2003) Mechanical & Electrical Manager 7) BC-010-1 / FWC1 (2010) Formwork Carpenter 8) BC-010-2 / FWC2 (2010) Formwork Foreman 9) BC-010-3 / STS3 (2010) Structural Supervisor 10) BBR1 (2008) Bar Bender 11) BBR2 (2008) Bar Bender 12) BC-011-1 / CCT1 (2010) Concreter I 13) BC-011-2 / CCT2 (2010) Concreter II

MSIC GROUP	CORRESPONDING NOSS/ LEVEL
	14) BC-020-3 /MSR3 (2010) Masonry Supervisor 15) BRL1 (2008) Bricklayer 16) BRL2 (2008) Bricklayer 17) PLR1 (2008) Plasterer 18) PLR2 (2008) Plasterer 19) TLR1 (2008) Tiler 20) TLR2 (2008) Tiler 21) F410-006-2:2018 IBS Lightweight Roof Trusses Installation 22) F410-006-3:2018 IBS Lightweight Roof Trusses Installation Supervision 23) BC-360-1 / RTT1 (2008) Roof Truss Installer (Timber) 24) BC-360-2 / RTT2 (2008) Roof Truss Installer (Timber) 25) F410-002-2:2017 IBS Blockwork System Installation 26) F410-002-3:2017 IBS Blockwork System Installation Supervision 27) F410-003-2:2017 IBS Reusable Formwork System Installation 28) F410-003-3:2017 IBS Reusable Formwork System Installation Supervision 29) F410-004-2:2017 IBS Precast Concrete Installation 30) F410-004-3:2017 IBS Precast Concrete Installation Supervision 31) CSH3 (2000) Construction Site Safety and Health Supervisor 32) F410-005-2:2018 IBS Lightweight Panel (Non-Structural) System Installation 33) F410-005-3:2018 IBS Lightweight Panel (Non-Structural) System Installation Supervision 34) F410-001-2:2019 Building Construction Operation 35) F410-001-3:2019 Building Construction Operation Supervision

2.7 Overview of Construction Industry in Developed Countries

The construction industry is one of the largest industries in the whole world. Even in developed countries, the construction industry is an important industry which acts as a major contributor to the economy and provides jobs to millions of people. Three countries are selected as overview of the construction industry namely the United States of America, United Kingdom and Indonesia. America is among the top countries in the world that invests in construction where more than $1.0 trillion worth of structures are completed each year. The construction output in the United Kingdom is more than £110 billion per annum and contributes 7% of GDP. Indonesia is chosen because Indonesia has the highest GDP in Southeast Asia. The construction sector contributes to 10% of the total GDP in Indonesia. The complete comparison between these countries are listed in Chapter 4.

2.8 The Relation of Industry and Industrial Revolution 4.0 (IR4.0)

Industrial production was transformed by steam power in the nineteenth century, electricity in the early twentieth century, and automation in the 1970s. These waves of technological advancement did not reduce overall employment. With the surge of automation in the construction industry, the number of construction jobs decreased but new jobs emerged and the demand for new skills increased. Today, another workforce transformation is on the horizon as construction experiences a fourth wave of technological advancement: the rise of new digital industrial technologies that are collectively known as the Industrial Revolution 4.0 (IR4.0). Table 2.8 shows the 9 main pillars of IR4.0 identified by Ministry of International Trade and Industry (MITI).

Table 2.8: The 9 Pillars of Industrial Revolution 4.0
(Source: Ministry of International Trade and Industry)

No.	Industrial Revolution 4.0 Pillars	Brief Description
1)	Autonomous Robots	Coordinated and automated actions of robots to complete tasks intelligently, with minimal human

No.	Industrial Revolution 4.0 Pillars	Brief Description
		input.
2)	Big Data Analytics	The analysis of ever larger volumes of data. Circulation, collection, and analysis of information is a necessity because it supports productivity growth based on a real-time decision-making process.
3)	Cloud Computing	Storing and accessing data and programs over the Internet instead of your computer's hard drive.
4)	Internet of Things (IOT)	All machines and systems connected to the production plant (as well as other systems) must be able to collect, exchange and save these massive volumes of information, in a completely autonomous way and without the need of human intervention.
5)	Additive Manufacturing (3D printing)	Use in prototyping, design iteration and small-scale production and often described as "rapid prototyping" - produce the desired components faster, more flexibly and more precisely than ever before.
6)	System Integration	The process of linking together different computing systems and software applications physically or functionally to act as a coordinated whole via Internet of Things-IoT.
7)	Cyber-security	With the increased connectivity and use of standard communications protocols, the need to protect critical industrial systems and manufacturing lines from cybersecurity threats is increasing.

No.	Industrial Revolution 4.0 Pillars	Brief Description
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.

Although the construction industry is a huge industry that gives significant impact to other industries, it still relies heavily on manual labour and mechanical technology. As a result, productivity has stagnated.

Only recently have digital technologies begun to enter the industry, gradually effecting how infrastructures are designed and constructed. These technologies, including prefabrication and modular construction, advanced building materials, 3D printing & additive manufacturing, autonomous construction, augmented reality & virtualisation, big data & predictive analytics, wireless monitoring & connected equipment, cloud & real time collaboration, 3D scanning & photogrammetry and building information modelling are affecting the entire construction industry. Their economic and social impact could be substantial, given that the construction industry accounts for 6% of global GDP.

2.9 Conclusion

The construction industry is an important and strategic part of the Malaysian industry. The overall construction industry employs around 1,330,266 people and contributes almost RM204.4 billion in 2017.

35 NOSS related to this division have been developed over the years. Certain NOSS titles in this group have not been revised and require immediate action to update the standard.

The findings on the industry landscape, MSIC 2008 definition of the job area, and the developed NOSS give an insight of the overall picture of the industry. These inputs pave the way and guide the next course of action in restructuring the occupational structure, identifying competencies in demand and critical job titles. The inclusion of Industrial Revolution 4.0 applications will give an impact to the future of the manpower in this area.

In order to materialise the above objectives, specific research methodologies were employed. The description of research strategies and approaches is discussed in the next chapter.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter gives an overview of the strategies for data collection and the analysis performed to meet the deliverables. In developing better understanding regarding the current development of the construction of buildings industry in Malaysia, this study used a mixed method research approach consisting of a mixture of quantitative and qualitative approaches.

The quantitative approach used survey questionnaires while the qualitative approach was based on document analysis and focus group discussion with industry experts. This mixed methods research design was to examine the problem statement and objectives of the research. By using both quantitative and qualitative methods, better insight of the industry was obtained besides identifying and building appropriate instruments used in the quantitative phase.

3.2 Research Approach

For this study, the research approach was subjected to 7 phase as shown in Figure 3.1:

Phase 1: Problem Identification: broad problem areas were identified through preliminary information gathering from secondary data and literature review.

Phase 2: Document Analysis: Secondary data collection was performed by reviewing published information available from sources such as websites, archives and other written reports.

Phase 3: Preparation of Qualitative Data Procedure: The interview protocol in the form of semi structure questionnaire was prepared in line with the objective of this study. The interview protocol was developed by the researchers themselves and verified by employing a triangulation strategy. In this approach, the researchers triangulated different data sources of information to build a coherent justification of the different themes in close relation to the aim of the study. Focus group was conducted with respondents from industry experts and practitioners.

Phase 4: Quantitative Instrument building: From the focus group discussion a reliable instrument was constructed and proposed to be used in the actual field survey.

Phase 5: Quantitative data collection: actual data collection was carried out. Both face to face and internet survey were carried out nationwide for generalisation purposes. Sample from the population was collected at random to be representative.

Phase 6: Data Analysis for both qualitative and quantitative data approach: Final verification by Focus group discussions was carried out. New focus group members were selected from industry players to look at the documents as a whole. They were requested to verify the descriptive analysis that was utilised in the quantitative approach. The issues of concern were related to competencies demand, job titles, and critical skills for the construction of building industry.

Phase 7: Discussion and recommendation: Final discussion on the study was conducted and recommendations for addressing the issues raised and competency development obtained.

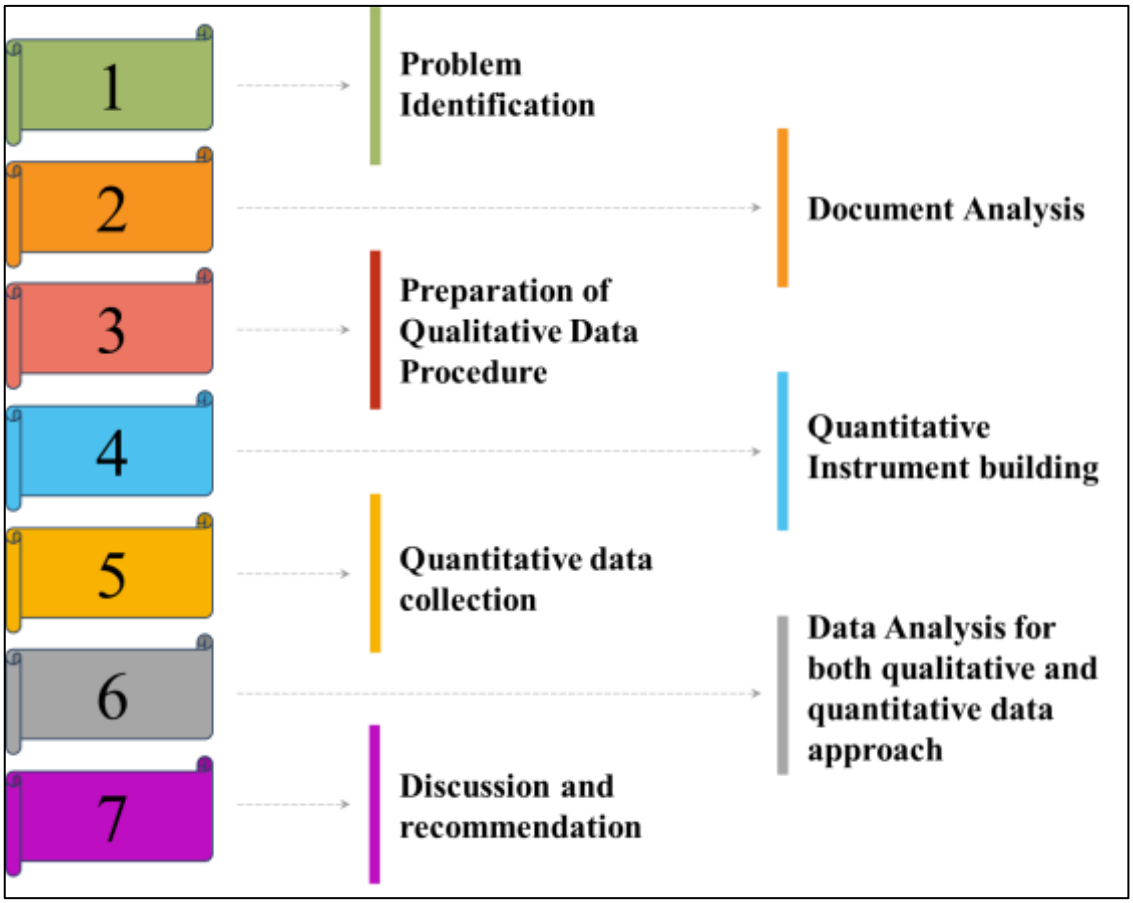

Figure 3.1: Phases of Research Methodology for Construction of Building Industry in Malaysia

Three approaches were selected to be employed for data collection. Figure 3.2 shows the approaches and outcomes in the OF development. These three data collection approaches can be grouped into:

a) Document Analysis;
b) Focus Group Discussion; and
c) Survey.

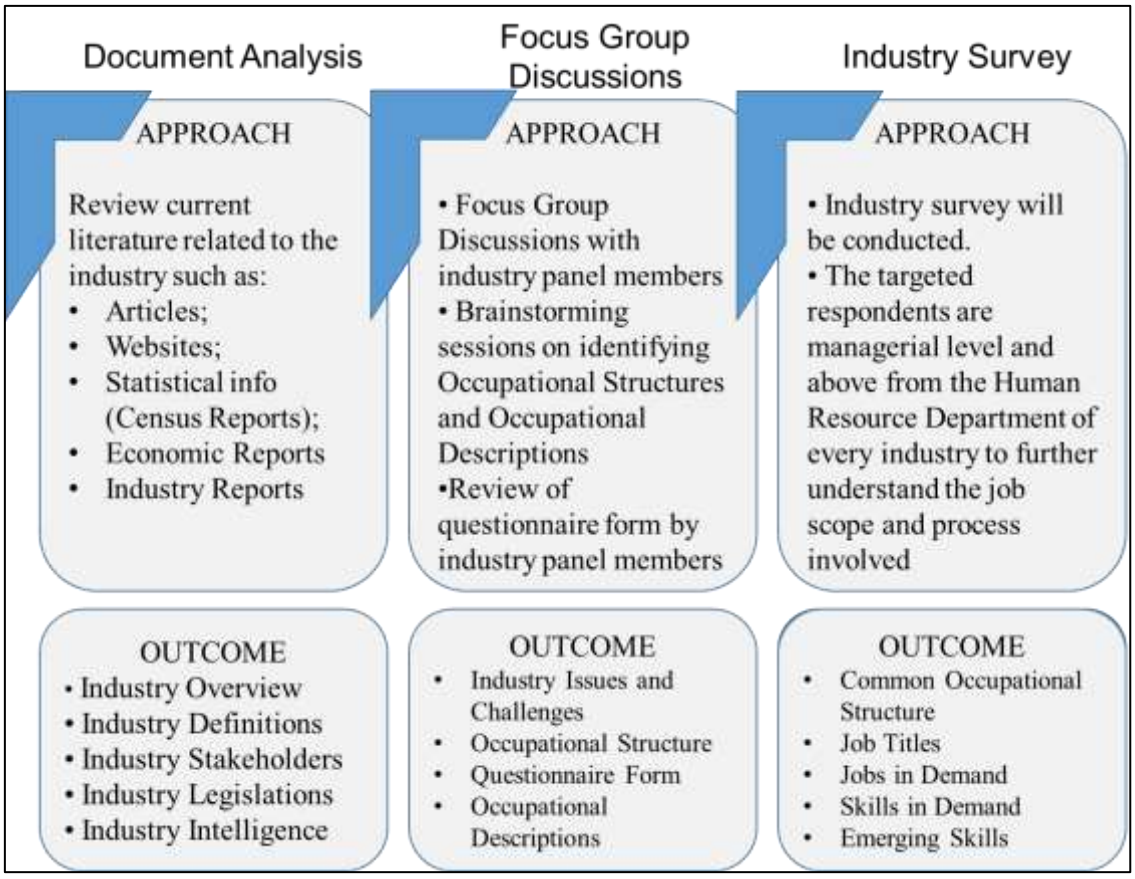

Figure 3.2: Occupational Framework Development Approach

3.2.1 Document Analysis

Rigorous review of existing literature that addressed clearly formulated questions was carried out. The purpose of document analysis was to systematically search, identify, select, appraise, and synthesise documents and research evidences found in the trade journal, academic paper and related journals. The collected data from this approach were used for the industry overview including industrial needs and requirements of IR4.0.

a) Data Collection Strategy

Two main sources were referred for data collection in Document Analysis:

i) Economic Database

ii) Database from other agencies (DSD, CIDB, MITI etc.)

i) Economic Database

Economic database provided the information related to labour and current market situation that are highly relevant to this study. Thus, the following were some sources of information:

- Department of Statistics Malaysia (DoSM).
- MSIC 2008
- Critical Occupational List (COL) by TalentCorp Malaysia
- Construction Industry Development Board (CIDB)

The purposes of obtaining the Economic Database are:

- To offer a snapshot of the current construction of building industry landscape and outlook.
- To serve as control figures and baselining database when assessing data obtained from the online survey.

ii) Database from other agencies (RMK11, DSD etc.)

In addition to the Economic database, database from other agencies (local and international agencies) that are relevant to construction of buildings were collected and analysed. Based on initial observation, the following database containing relevant information for the industry were referred.

- Local database – DSD, CIDB and MIDA
- International database – Organization for Economic Co-operation and Development (OECD), World Bank and European Union (EU).

b) Data Analysis Procedure

Based on the two sources, the following data analysis procedures were carried out.

i) Described the economic performances of the industry by looking at several macroeconomic indicators (such as GDP, employment and output).

ii) Examined the industry outlook in relation to regional and global perspectives.
iii) Analysed the profile of the current and future workforce (such as occupations).
iv) Reviewed technological development in the industry (such as robotic & automation as well as elements of IR4.0).

3.2.2 Focus Group Discussion

In focus group discussion (FGD), industry engagement based on FGD was conducted to enable in-depth discussions on the issues of the industry. The FGD involved the discussion on the occupational structure, job description, assessment of curriculum and training programmes; accreditation and qualification based on NOSS and Malaysian Qualification Analysis (MQA), potential workforce challenges; future outlook and strategic recommendations.

Seven industry experts were selected for the focus group discussion which was facilitated by a facilitator to encourage dialogue among the panel members. The facilitator was commissioned by the Department of Skills Development (DSD) to develop the OF according to the guidelines that have been set. The function of the facilitator is to elicit information from the industry experts in order to develop the OF in accordance with the format prescribed by the DSD. The industry expert must be a person who has at least 7 years' experience in the related industry and works with a company registered with SSM.

Two FGD meetings were conducted. In the first FGD meeting, semi structured questions were used. It focused on OS and OD construction and was based on four themes namely competencies in demand, jobs in demand, emerging skills and related issues. The identification of critical job in the construction of buildings industry was determined in the focus group discussion. The final FGD meeting verified and validated the results from the findings of the study.

Sample FGD semi structured interview questions:

1) What will the industry OS look like?
2) What will be the job description for each job title?
3) Which industry skills are high in demand?
4) Which job titles are in line with IR4.0?
5) Which are the critical jobs for the industry?

a) Data Collection Strategy

In the process of gathering the input, brainstorming techniques were adopted by the expert panel members to discuss the different sub-sectors and areas. Information found in secondary documents were also discussed and presented to the development panel members. The information gathered were used as input for the development of the Occupational Framework. Follow up discussions with the expert panel members were done in smaller groups to verify the findings of the OF.

b) Data Analysis Procedure

The following analyses were carried-out during the FGD sessions.

i) Assessing the potential workforce challenges faced by the overall industry.
ii) Examining the demand and supply of talent in the construction of buildings industry according to NOSS and MQA standards.
iii) Recommending review of the curriculum and training programmes relevant for the construction of buildings workforce development in coordination with accreditation bodies (MQA and DSD) and training providers, comprising local academic institutions (universities or colleges), vocational and other training entities.
iv) Analysing future trends of the occupational demand by various skill categories including TVET related occupations.
v) Reviewing initial findings obtained from the online survey.

3.2.3 Survey

This study employed online survey to achieve 4 key information namely competencies in demand, jobs in demand, emerging skills and related issues. Google forms were used as a platform for the internet survey. The survey was specifically distributed to related organisations based on designations at organisational level. The survey form were divided into 4 sections as in Figure 3.3:

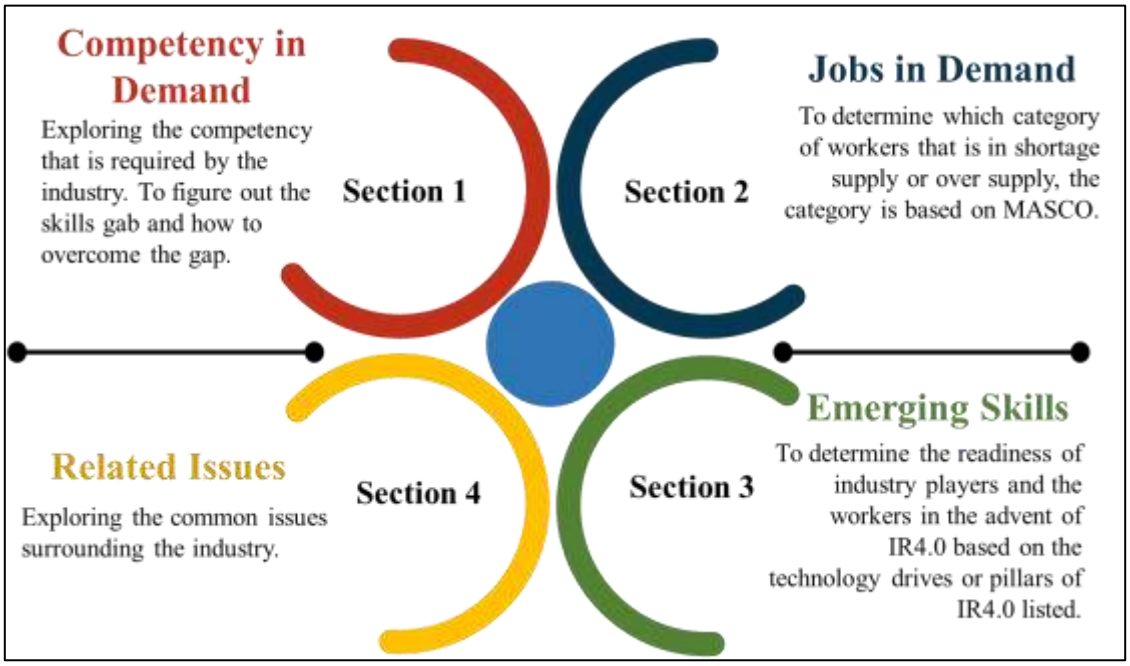

Figure 3.3: 4 Key Information from Survey

a) Establishment and Sampling Procedure

According to Roscoe (1975), sample size of 30 and less than 500 are appropriate for most research[46]. Therefore, since the total population is 15,857 companies, the number of sample establishments is 56 and number of targeted respondents are 30. However, to minimize errors in sampling and to take care issues of non-response, the number of targeted respondents were doubled and a total of 70 questionnaires were distributed to selected companies or organisations. For respondent's response rate, based on Baruch, Y & Holtom,

[46] Roscoe, J.T. (1975), Fundamental Research Statistic for the Behavioral Science, International Series in Decision Process, 2nd Edition, Holt, Rinehart and Winston , Inc, New York.

B.C (2008), the average level of response rate is 52.7 per cent[47]. After data collected exercise was conducted, there are 53 totals of questionnaire collected. The targeted respondents were among the managerial levels in the related company and association in the industry or human resources director.

Based on sample size calculator software Raosoft, the sample size was calculated and the results was shown in Table 3.1. This research used 10% margin of error based on Weisberg & Bowen (1977) which stated 10% margin of error are acceptable for this kind of research[48].

Table 3.1: Number of Targeted Respondents According to MSIC 2008 Group

SECTION	F	CONSTRUCTION	NUMBER OF ESTABLISHMENT	NUMBER OF SAMPLE	NUMBER OF TARGETED RESPONDENTS	NUMBER OF ACTUAL RESPONDENTS
DIVISION	**41**	Construction of buildings				
GROUP	**410**	Construction of buildings	**15,857**	**68**	**35**	**53**

b) Questionnaire design

The questionnaire was designed based on the feedback from focus group discussion. It focussed on the 4 key information namely competencies in demand, jobs in demand, emerging skills and related issues.

To increase response rate and consistent responses, the questionnaire was designed based on close-ended questions with interval scale appropriate to the

[47] Baruch, Y., & Holtom, B. C. (2008). Survey response rate levels and trends in organizational research. *Human relations*, *61*(8), 1139-1160.
[48] Weisberg, H. F. & Bowen, B.D. (1977). An Introduction to Survey Research and Data Analysis. San Francisco: W. H. Freeman

instrument. To ensure content validity and face validity, certain procedures were employed. For content validity, at pre-test stage two experts from the academic and industry sectors validated the questionnaire. They looked into the content, grammar, phrasing of sentences and understanding of the items used. After the pre-testing stage was completed, a pilot test was conducted to retest the instrument for this study among at least 10 respondents similar to the respondents for the actual survey that was conducted.

c) Measures and Instrumentation

For this study, several measures were used in the various sections of the questionnaire. Section 1 is on Competencies in Demand and uses a 4 interval scales ranging from 4 (High in demand), 3 (In Demand), 2 (Low in demand) and 1 (Not in demand). It measures the intensity of job demands against supply or labour.

Section 2 is on Jobs in Demand and uses 3 interval scales ranging from Low Demand, Mid Demand and High Demand to measure the shortage of manpower in construction of building industry.

Section 3 is on Emerging Skills. It contains close-ended questions and uses 4 interval scales ranging from 4 (High in demand), 3 (In Demand), 2 (Low in demand) and 1 (Not in demand) to measure the important prerequisites and skills for IR4.0 in the construction of buildings industry.

In Section 4, related issues regarding the industry are discussed based on 4 interval scale ranging from 4 (Strongly Agree), 3 (Agree), 2 (Disagree) and 1 (Strongly disagree). It identifies the key issues in the Construction of building industry.

d) Data Collection Strategy

Time and cost have always been an influencing factor that affects the determination of response rate for a primary survey. The population of the industry is large and will require a significant financial budget if a nationally representative survey is the primary target. The consultation with related associations concluded that a nationally representative survey will not be feasible thus, instead of aiming for a nationally representative sample, the survey aims to increase participation rates from industries.

Three approaches were used for the data collection.

i) Approaching the related associations' members. The secretariat of each association agreed to distribute the questionnaire.
ii) Industry engagements/interviews/visits were scheduled to seek their assistance to distribute the online survey to the members of respective associations.
iii) Assistance from MITI, MIDA and CIDB was obtained to provide the institutional support when engaging the selected respondents.

To reduce bias in the survey procedure, Armstrong and Overton (1977) suggested extrapolation method to be employed[49]. Non-response bias (error) will occur when respondents vary in significant ways from the non-respondents in the research (Sekaran, 2013) which is common in face to face and via mail surveys method[50]. For this study, personal distribution of survey questionnaire (face to face) method were employed for data collection. Non-response from respondents, usually occurs when respondents decline to answer or have language problems (Groves, 2002)[51]. In order to encourage good response rates

[49] Armstrong, J. S., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. Journal of marketing research, 14(3), 396-402.
[50] Sekaran, U., and R. Bougie. "Theoretical framework in theoretical framework and hypothesis development." Research methods for business: A skill building approach 80
[51] Groves, R. M. (2002). Survey nonresponse (Vol. 326). Wiley-Interscience.

from the respondents, a token of appreciation was given to respondents for each questionnaire completed. .

e) Data Analysis Procedure

The following analyses were performed for the online survey.

i) Descriptive analysis of employment profiles and other variables that are included in the questionnaire.
ii) Analysis of critical occupations identified by the industry
iii) Analysis of future trend of the occupational demand by various skills category including TVET related occupations.
iv) Analysis of talent gaps between supply and demand according to NOSS and MQA standards
v) Analysis of training provided by industries to employees

3.3 Conclusion

For this study several selected research methodologies were utilised namely: document analysis, survey and questionnaire and focus group discussion. Document analysis was chosen as an efficient and effective way of gathering data in a variety of forms. Obtaining and analysing documents is often far more cost efficient and time efficient than conducting research and experiment. Related current statistics of the industry were retrieved from reliable sources. Survey and questionnaire were deployed in this research to make some generalisation on the industry. More concise questionnaires were prepared to focus on specific group of respondents. Last but not least, focus group discussions were conducted in this study to generate new ideas that can be very useful for decision-making. It is also a fast way to gain the needed information regarding job titles in the related industry. This approach is a time saving and effective way to gather information from many sources.

CHAPTER 4: FINDINGS

4.1 Introduction

This chapter elaborates the findings of this research on 2 digits MSIC 2008, Division 41. The findings are based on the objectives set for the study namely to produce the OS for construction of building industry based on MSIC 2008, to determine Occupational Descriptions (OD) for each job title identified in the latest industry OS, to highlight competencies in demand in the construction of building industry, to identify job titles related to Industry Revolution 4.0 (IR4.0) and to determine critical jobs in the construction of building industry. This chapter highlights the findings gathered on these key areas.

4.2 Findings Analysis

This section provide the summaries of the data collected. It involves the interpretation of data gathered through the questionnaires and response from the related industry. The questionnaires data are eventually be correlated with the findings from the focus group discussion with expert panel from the construction of buildings industry and document analysis to determine patterns, relationships or trends.

4.2.1 Discussion of Results

The identified occupational structure, occupational description for job titles, competencies in demand and critical jobs for the construction of buildings industry were obtained through focus group discussion with industry experts during the development workshop and survey from the companies in the industry. These analyses were discussed based on the main groups in Division 41: Construction of Buildings.

Research instruments used were focus group discussions, document analysis and survey. The initial information gathered by using document analysis were used as the basis for the focus group discussion workshop. Then, survey forms were distributed to gain more information related to the discussion and also to validate the data obtained from focus group discussion and document analysis. During the focus group discussion workshops, the information on construction of buildings was analysed and grouped into 16 main areas as stated below: -

1) Form work (Pile cap)
2) Rebar / Spacer (Pile cap)
3) Concreting (Pile cap)
4) Form work (Ground Beam)
5) Rebar / Spacer (Ground Beam)
6) Concreting (Ground Beam)
7) Form work (In Situ Work)
8) Rebar / Spacer (In Situ Work)
9) Concreting (In Situ Work)
10) Cutting / Welding (Steel Work)
11) Installation (Steel Work)
12) Cutting / Joining (Timber Work)
13) Installation (Timber Work)
14) IBS Reusable Form Work
15) IBS Blockwork
16) IBS Precast Concrete

Even though the survey distributed did not cover all 15,857 company in construction of buildings industry, it included companies of all sizes from all states in Malaysia. Thus, the results of the survey from 53 respondent do represent most of the issues regarding construction of buildings industry in Malaysia.

4.2.2 Jobs in Demand

Jobs in demand can be defined as the occupations that are highly needed and hard to fill due to the nature of jobs that require certain set of skills. Based on the focus group discussion with the expert panel of the industry and MASCO 2013 classification of workers, the job titles are divided into three category of workers which are low skilled workers, semi-skilled workers and skilled workers. This category of skilled workers are then mapped to the corresponding level of MQF as listed in Table 4.1 below.

Table 4.1: Category of Skilled Workers Corresponding to the Level of MQF

CATEGORY OF SKILLED WORKERS	LOW SKILLED WORKERS	SEMI-SKILLED WORKERS	SKILLED WORKERS
Level	1	2 and 3	4 - 8

Based on the focus group discussion, jobs in demand and factors contributing to the demand for the construction of buildings industry are identified and listed in Table 4.2 below.

Table 4.2: Jobs in Demand and Factors Contributing to Demand for Construction of Buildings

NO.	JOB TITLES	AREA	FACTOR(S) CONTRIBUTING TO THE DEMAND	SPECIFIC REQUIREMENTS AND SKILLS
1.	Carpenter (Semi-skilled worker)	a) Pile Cap b) Ground Beam c) In-Situ Work	a) Require specific skills to perform job. b) Shortage of local workers.	a) CIDB green card. b) Carpentry skills and experience required.

NO.	JOB TITLES	AREA	FACTOR(S) CONTRIBUTING TO THE DEMAND	SPECIFIC REQUIREMENTS AND SKILLS
			c) Perceived as 3D job.	
2.	Bar bender (Semi-skilled worker)	a) Pile Cap b) Ground Beam c) In-Situ Work	a) Require specific skills to perform job. b) Shortage of local workers. c) Perceived as 3D job.	a) CIDB green card. b) Bar bending skills and experience required.
3.	Concretor (Semi-skilled worker)	a) Pile Cap b) Ground Beam c) In-Situ Work	a) Require specific skills to perform job. b) Shortage of local workers. c) Perceived as 3D job.	a) CIDB green card. b) Concreting skills and experience required.
4.	Supervisor (Semi-skilled worker)	a) Pile Cap b) Ground Beam c) In-Situ Work d) Steel Work e) Timber Work	a) Required by the CIDB act.	a) CIDB green card. b) Accreditation of site supervisors by CIDB. c) Knowledge of construction trades under supervision. d) Ability to supervise

NO.	JOB TITLES	AREA	FACTOR(S) CONTRIBUTING TO THE DEMAND	SPECIFIC REQUIREMENTS AND SKILLS
				different construction trades.
5.	Welder (Semi-skilled worker)	a) Steel Work	a) Require specific skills to perform job. b) Shortage of competent welder. c) Competent welders prefer to work oversea or other industries (oil & gas and shipyard) which pays better.	a) CIDB green card. b) Welding competency certificate.
6.	Foreman (Semi-skilled worker)	a) Steel Work	a) Essential for construction. b) Shortage of competent welder. c) Competent welders prefer to work oversea or other industry (oil & gas and shipyard) which pays better.	a) CIDB green card. b) Accreditation of site supervisors by CIDB. c) Welding competency certificate.

NO.	JOB TITLES	AREA	FACTOR(S) CONTRIBUTING TO THE DEMAND	SPECIFIC REQUIREMENTS AND SKILLS
7.	Installer (Semi-skilled worker)	a) Steel Work b) Timber Work	a) Shortage of skilled and experienced local workers.	a) CIDB green card. b) Installation skill.
8.	Joiner (Semi-skilled worker)	a) Timber Work	a) Shortage of young, skilled and experienced local workers. b) Perceived as 3D job.	a) CIDB green card. b) Carpentry skill.
9.	IBS – Supervisor (Semi-skilled worker)	a) IBS Reusable Form Work b) IBS Blockwork c) IBS Precast Concrete	a) Required by the CIDB act. b) Increase demand for IBS system.	a) CIDB green card. b) Accreditation of site supervisors by CIDB. c) Knowledge and skill in IBS system.
10.	IBS - Installer (Semi-skilled worker)	a) IBS Reusable Form Work b) IBS Blockwork c) IBS Precast Concrete	a) Shortage of skilled and experienced local workers. b) Increase demand for IBS system.	a) CIDB green card. b) Installation skill. c) Knowledge and skill in IBS system.

Based on the survey distributed, it was observed that most of the respondents agree that the jobs most in demand for the construction of building in pile cap/footing, stump/ground beam, in situ work, steel work, timber work, IBS reusable formwork, IBS blockwork and IBS precast concrete are for the semi-skilled workers followed by low skilled workers and skilled workers as shown in Figures 4.1 to Figure 4.7 below.

Figure 4.1 shows the jobs in demand for pile cap area in the construction industry. Based on the data survey obtained from 53 respondents. 39 respondents agreed that semi-skilled workers are high in demand, 12 respondents agreed that low-skilled workers are in demand while only 3 respondents agreed that skilled worker are in demand. From these, we can conclude that for the pile cap area, the jobs most in demand are for semi-skilled workers followed by low skilled workers and skilled workers.

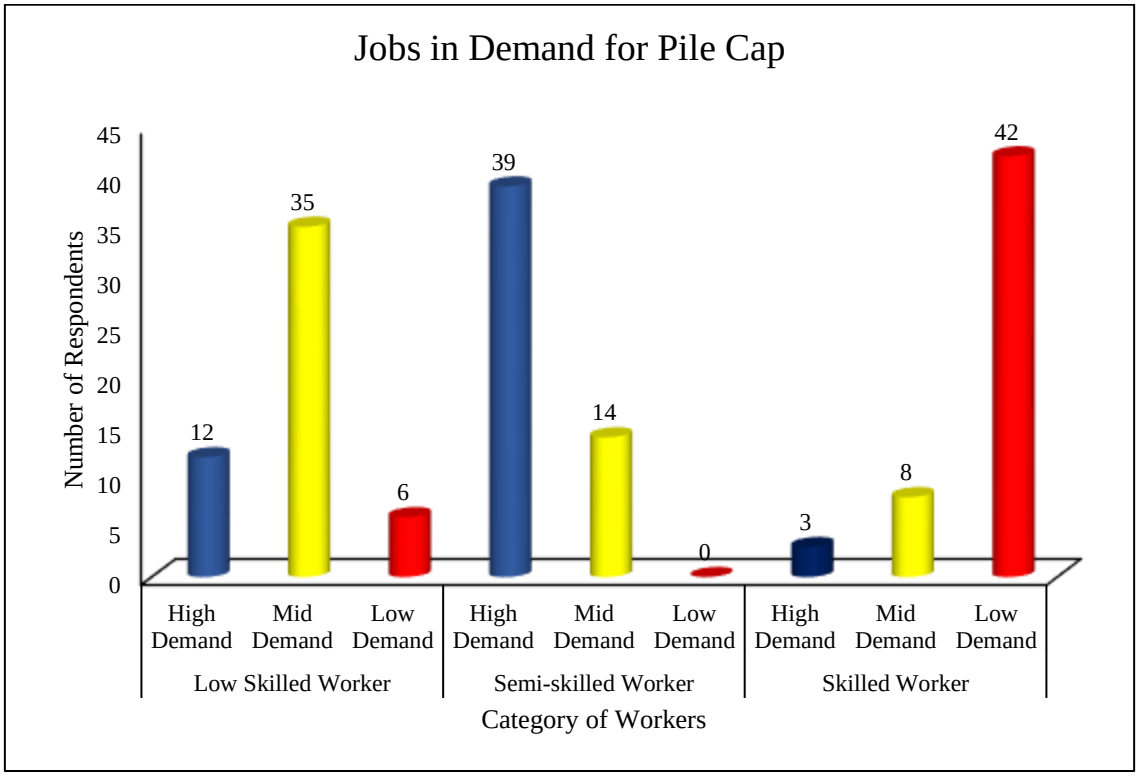

Figure 4.1: Jobs in Demand for Pile Cap

Figure 4.2 shows jobs in demand for the area of ground beam. Based on the survey data obtained, 14 respondents agreed that low skilled workers are high in demand, 37 respondents agreed that semi-skilled worker are in demand while only 4 respondents agreed that skilled workers are in demand. From these, we can conclude that for the

ground beam area, the jobs that are most in demand are for semi-skilled workers followed by low skilled workers and skilled workers.

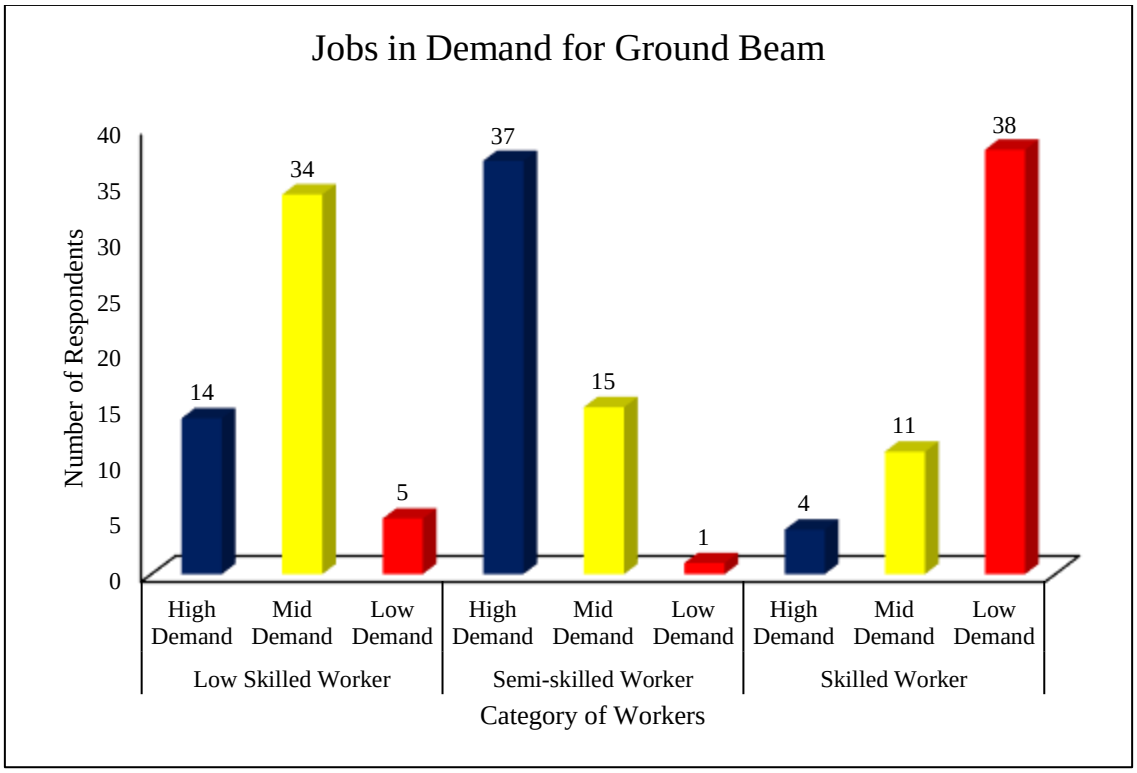

Figure 4.2: Jobs in Demand for Ground Beam

Figure 4.3 shows the jobs in demand for the area of in situ work in construction industry. Based on the survey data obtained, 36 respondents agreed that semi-skilled workers are high in demand, 11 respondents agreed that low skilled workers are in demand while only 2 respondents agreed that skilled workers are in demand. From these, we can conclude that for the in situ work area, the jobs that are most in demand are for semi-skilled workers followed by low skilled workers and skilled workers.

Figure 4.4 shows the jobs in demand for the area of steel work. Based on the survey data obtained, 13 respondents agreed that low skilled workers are high in demand, 37 respondents agreed that semi-skilled workers are in demand while only 4 respondents agreed that skilled workers are in demand. From these, we can conclude that for the steel work area, the jobs that are most in demand are for semi-skilled workers followed by low skilled workers and skilled workers.

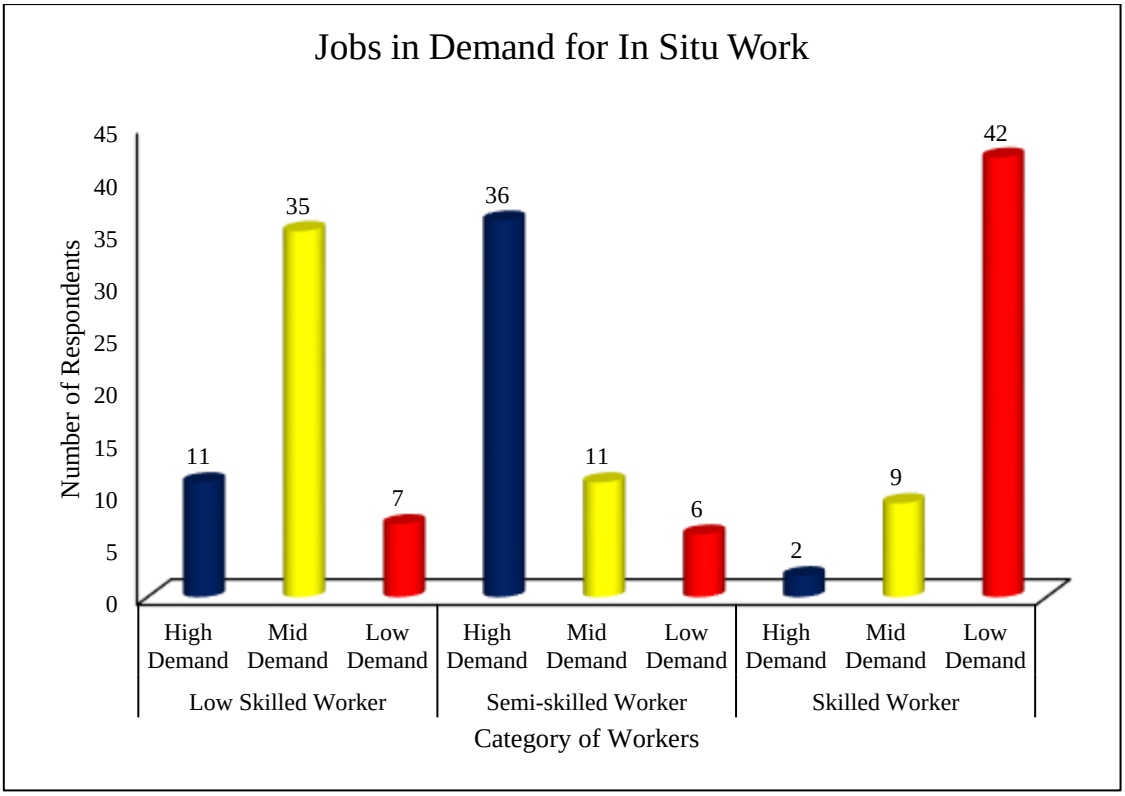

Figure 4.3: Jobs in Demand for In Situ Work

Figure 4.4 shows the jobs in demand for the area of steel work. Based on the survey data obtained, 13 respondents agreed that low skilled workers are high in demand, 37 respondents agreed that semi-skilled workers are in demand while only 4 respondents agreed that skilled workers are in demand. From these, we can conclude that for the steel work area, the jobs that are most in demand are for semi-skilled workers followed by low skilled workers and skilled workers.

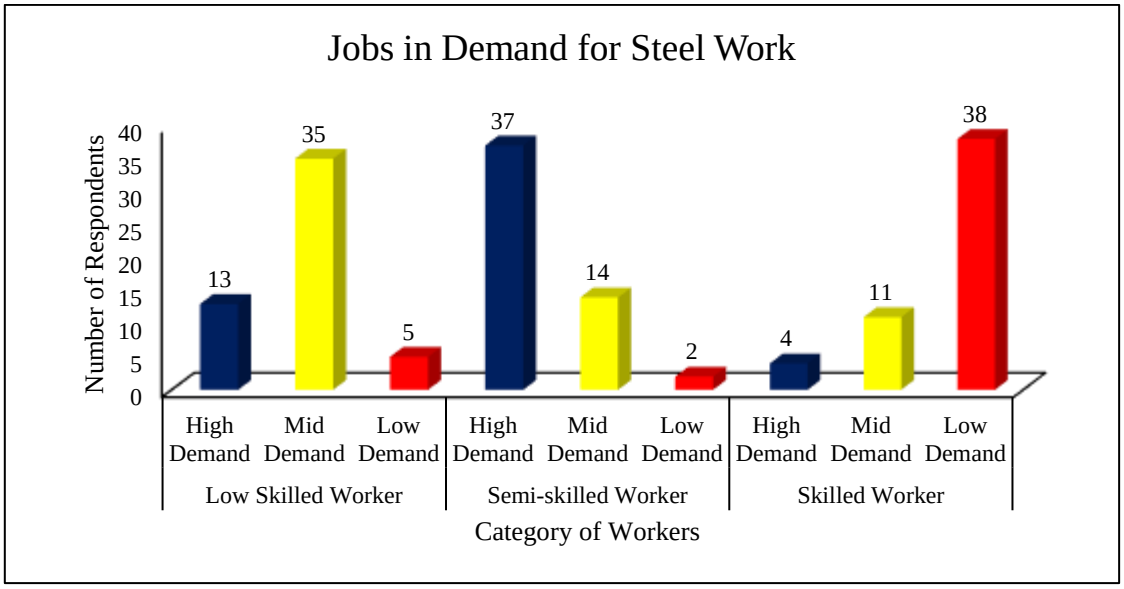

Figure 4.4: Jobs in Demand for Steel Work

Figure 4.5 shows the jobs in demand for timber work area in construction industry. Based on the survey data obtained, 35 respondents agreed that semi-skilled workers are high in demand, 13 respondents agreed that low skilled workers are in demand while only 3 respondents agreed that skilled workers are in demand. From these, we can conclude that for the timber work area, the jobs that are most in demand are for semi-skilled workers followed by low skilled workers and skilled workers.

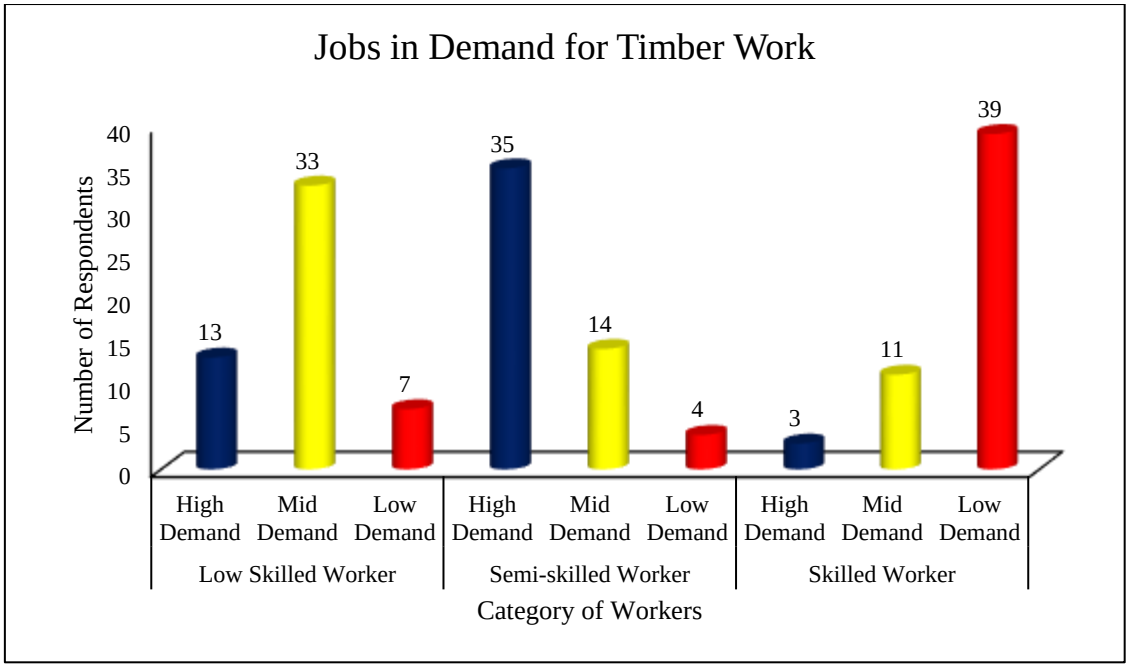

Figure 4.5: Jobs in Demand for Timber Work

Figure 4.6 shows the jobs in demand for IBS – reusable form area. Based on the survey data obtained, 12 respondents agreed that low skilled workers are high in demand, 38 respondents agreed that semi-skilled workers are in demand while only 1 respondent agreed that skilled worker are in demand. From these, we can conclude that for the IBS – reusable form area, the jobs that are most in demand are for semi-skilled workers followed by low skilled workers and skilled workers.

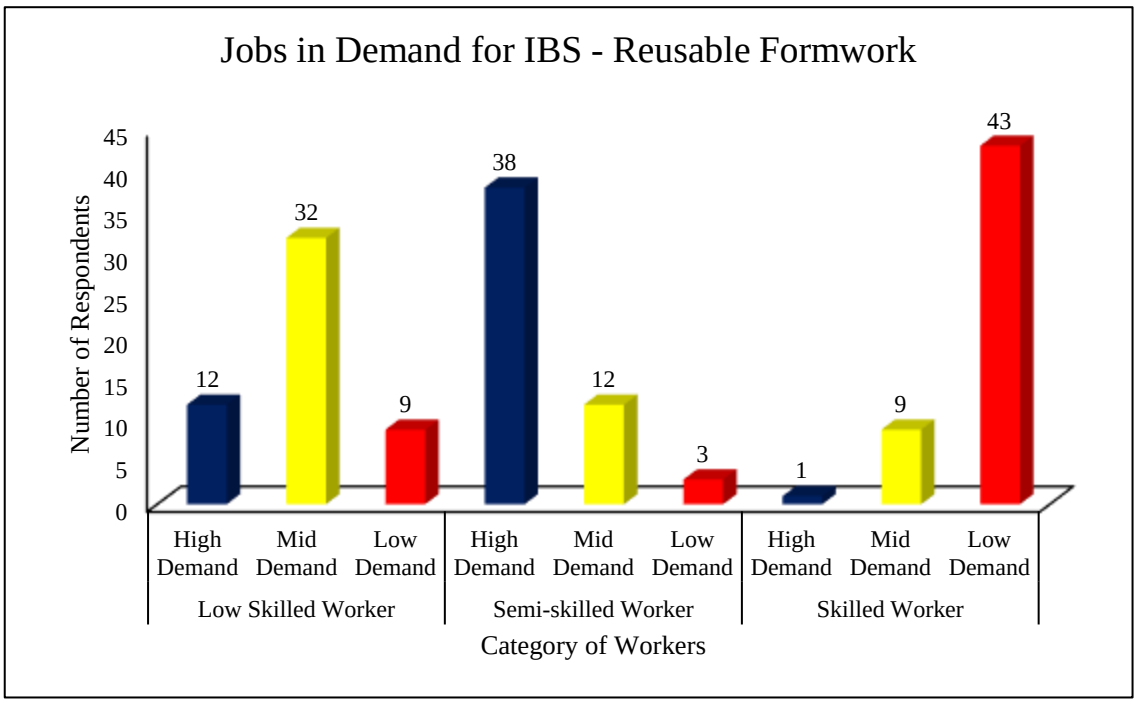

Figure 4.6: Jobs in Demand for IBS Reusable Formwork

Figure 4.7 shows the jobs in demand for IBS - blockwork area. Based on the survey data obtained, 40 respondents agreed that semi-skilled workers are high in demand, 11 respondents agreed that low skilled workers are in demand while only 1 respondent agreed that skilled workers are in demand. From these, we can conclude that for the IBS - blockwork area, the jobs that are most in demand are for semi-skilled workers followed by low skilled workers and skilled workers.

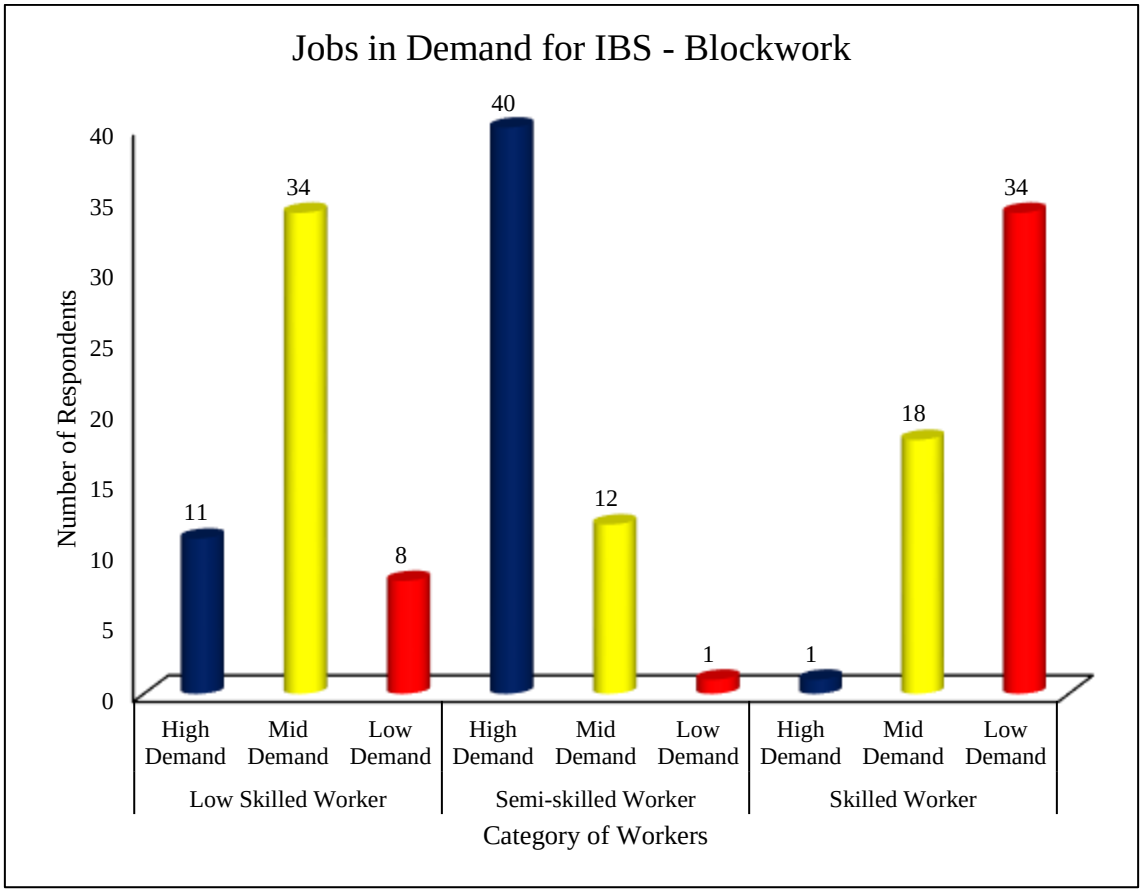

Figure 4.7: Jobs in Demand for IBS Blockwork

Figure 4.8 shows the jobs in demand for IBS – precast concrete area. Based on the survey data obtained, 12 respondents agreed that low skilled workers are high in demand, 38 respondents agreed that semi-skilled workers are in demand while only 1 respondent agreed that skilled workers are in demand. From these, we can conclude that for the IBS – precast concrete area, the jobs most in demand are for semi-skilled workers followed by low skilled workers and skilled workers.

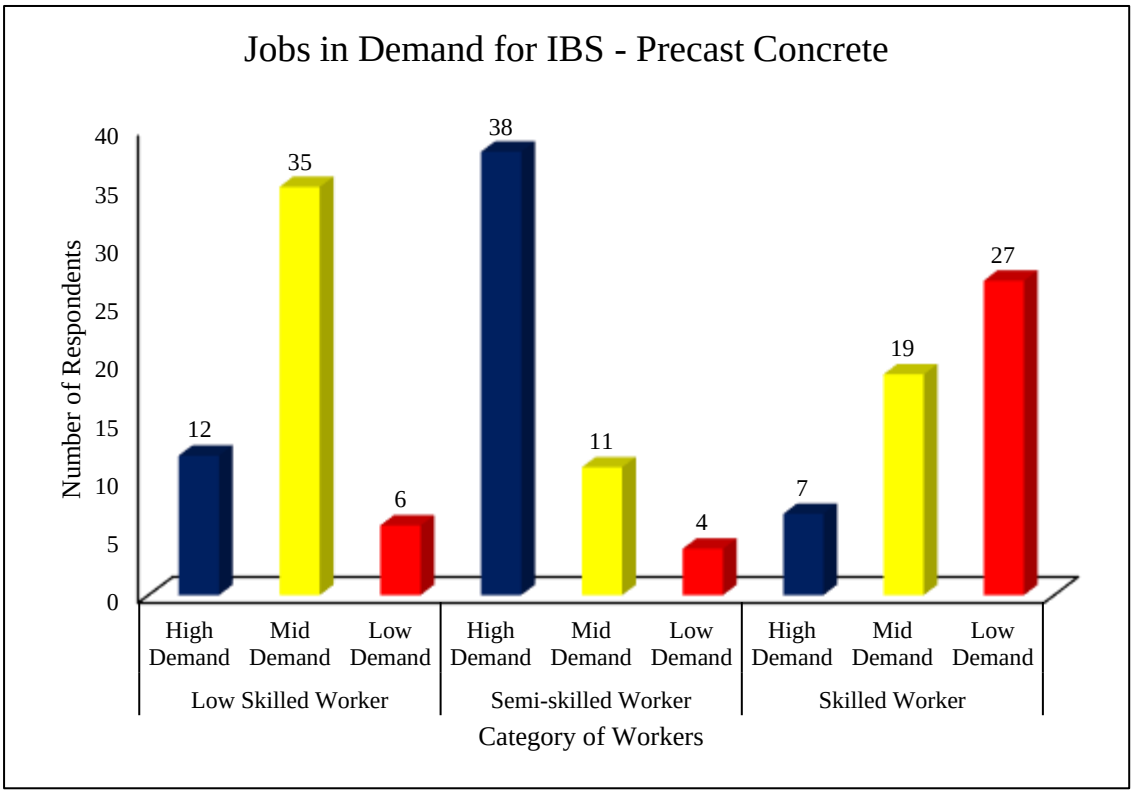

Figure 4.8: Jobs in Demand for IBS – Precast Concrete

Based on both results from the focus group discussion and the responses from the survey, it can be concluded that the jobs in demand for the construction of building industry are mainly from semi-skilled workers which correspond to level 2 and 3 from the occupational structure.

The Government of Malaysia established the Critical Skills Monitoring Committee (CSC) as part of the Eleventh Malaysian Plan with the mandate to monitor skills imbalances. One of the CSC's primary objectives is to develop a Critical Occupations List (COL) to serve as a platform for the coordination of human capital development policies. The COL is a list of occupations for which there is strong evidence that there is significant labour market shortage that may be alleviated through Government action. Occupations on the COL meet the criteria of being skilled, sought-after, and strategic. The COL seeks to identify and draw stakeholders' attention to this set of occupations that

are critical to the continued growth and development of the Malaysian economy but that are currently difficult to fill[52].

The OS produced for the construction of buildings industry is mapped with E-Masco and COL as shown in Table 4.3. 42 critical job titles identified in the OS are also listed in E-Masco. However, there is only one critical job title in the OS that matches those listed in COL.

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

Table 4.3: Occupational Structure vs E-Masco vs Critical Occupational List

NO	CRITICAL JOB TITLE	AREA	OS	E-MASCO	CRITICAL OCCUPATIONAL LIST
CONVENTIONAL					
1)	Carpenter	Formwork (Pile Cap)	√	√	X
2)	Supervisor	Formwork (Pile Cap)	√	√	X
3)	Coordinator	Formwork (Pile Cap)	√	√	X
4)	Bar bender	Rebar/Spacer (Pile Cap)	√	√	X
5)	Supervisor	Rebar/Spacer (Pile Cap)	√	√	X
6)	Coordinator	Rebar/Spacer (Pile Cap)	√	√	X
7)	Concretor	Concreting (Pile Cap)	√	X	X
8)	Supervisor	Concreting (Pile Cap)	√	√	X
9)	Coordinator	Concreting (Pile Cap)	√	√	X
10)	Carpenter	Formwork (Ground Beam)	√	√	X
11)	Supervisor	Formwork (Ground Beam)	√	√	X
12)	Coordinator	Formwork (Ground Beam)	√	√	X
13)	Bar bender	Rebar/Spacer (Ground Beam)	√	√	X
14)	Supervisor	Rebar/Spacer (Ground Beam)	√	√	X
15)	Coordinator	Rebar/Spacer (Ground Beam)	√	√	X
16)	Concretor	Concreting (Ground Beam)	√	X	X
17)	Supervisor	Concreting (Ground Beam)	√	√	X
18)	Coordinator	Concreting (Ground Beam)	√	√	X
19)	Carpenter	Formwork (In Situ Work)	√	√	X
20)	Supervisor	Formwork (In Situ Work)	√	√	X

NO	CRITICAL JOB TITLE	AREA	OS	E-MASCO	CRITICAL OCCUPATIONAL LIST
21)	Coordinator	Formwork (In Situ Work)	√	√	X
22)	Bar bender	Rebar/Spacer (In Situ Work)	√	√	X
23)	Supervisor	Rebar/Spacer (In Situ Work)	√	√	X
24)	Coordinator	Rebar/Spacer (In Situ Work)	√	√	X
25)	Concretor	Concreting (In Situ Work)	√	X	X
26)	Supervisor	Concreting (In Situ Work)	√	√	X
27)	Coordinator	Concreting (In Situ Work)	√	√	X
28)	Welder	Cutting/Welding (Steel Work)	√	√	√
29)	Foreman	Cutting/Welding (Steel Work)	√	√	X
30)	Coordinator	Cutting/Welding (Steel Work)	√	√	X
31)	Installer	Installation (Steel Work)	√	X	X
32)	Supervisor	Installation (Steel Work)	√	√	X
33)	Coordinator	Installation (Steel Work)	√	√	X
34)	Joiner	Cutting/Joining (Timber Work)	√	X	X
35)	Supervisor	Cutting/Joining (Timber Work)	√	√	X
36)	Coordinator	Cutting/Joining (Timber Work)	√	√	X
37)	Installer	Installation (Timber Work)	√	X	X
38)	Supervisor	Installation (Timber Work)	√	√	X
39)	Coordinator	Installation (Timber Work)	√	√	X
INDUSTRIALISED BUILDINGS SYSTEM					
40)	Installer (Reusable Formwork)	IBS Reusable Formwork	√	√	X

NO	CRITICAL JOB TITLE	AREA	OS	E-MASCO	CRITICAL OCCUPATIONAL LIST
41)	Supervisor (Reusable Formwork)	IBS Reusable Formwork	√	√	X
42)	Coordinator (Reusable Formwork)	IBS Reusable Formwork	√	√	X
43)	Installer (Blockwork)	IBS Blockwork	√	√	X
44)	Supervisor (Blockwork)	IBS Blockwork	√	√	X
45)	Coordinator (Blockwork)	IBS Blockwork	√	√	X
46)	Installer (Precast Concrete)	IBS Precast Concrete	√	√	X
47)	Supervisor (Precast Concrete)	IBS Precast Concrete	√	√	X
48)	Coordinator (Precast Concrete)	IBS Precast Concrete	√	√	X

4.2.3 Competencies in Demand

Based on the focus group discussion with expert panel from the construction of buildings industry, several competencies that are related to the industry are identified. The competencies and their definition are listed in Table 4.4. This list is included in the survey which is distributed to the respondents to get the information regarding the competencies that are most in demand in the industry.

Table 4.4: List of Competencies and Definitions

No.	Competencies	Definitions
1)	Technical skills	The abilities and knowledge needed to perform specific tasks. They are practical, and often relate to mechanical, information technology, mathematical, or scientific tasks.
2)	Communication skills	Skills to pass information effectively to other people. It may be used vocally, written or non-verbally.
3)	Diagnostic skills	The ability to identify a particular problem and define it.
4)	Troubleshooting / problem solving skills	Ability to adopt a systematic approach towards identifying and then solving a problem or issue at hand.
5)	Administration skills	Ability to complete tasks related to managing a business.
6)	Leadership skills	Strengths and abilities individuals demonstrate that help to oversee processes,

No.	Competencies	Definitions
		guide initiatives and steer their employees toward the achievement of goals.
7)	Analytical skills	Ability to collect and analyse information, solve problem, and make decisions.
8)	Planning and forecasting abilities	Ability to cope with the uncertainty of the future, relying mainly on data from the past and present and analysis of trends.
9)	General attitude towards work	Attitude that includes commitment, resourcefulness, teamwork and etc.
10)	Product knowledge	Ability to communicate information and answer questions about a product or service.
11)	Construction method knowledge	Knowledge regarding method and technique used in construction.
12)	Quality assurance and quality control knowledge	The process or set of processes used to measure and assure the quality of a product.
13)	Strong technical prediction	Ability to use patterns in market data to identify trends and make predictions.
14)	Computer literacy	Knowledge and ability to utilize computers and related technology efficiently.

No.	Competencies	Definitions
15)	Knowledge of others tools & device	Knowledge of other equipment that might not be used in daily work.

Based on the distributed survey, several competencies have been identified as in demand for the low skilled workers in construction industry. The competencies in demand for low skilled workers are construction method knowledge (50 respondents agreed it is in high demand, general attitude towards work (45 respondents agreed it is high in demand), product knowledge (40 respondents agreed it is high in demand) and technical skills (22 respondents agreed it is high in demand and 23 respondents agreed it is in demand). The full results can be seen in Figure 4.9 below.

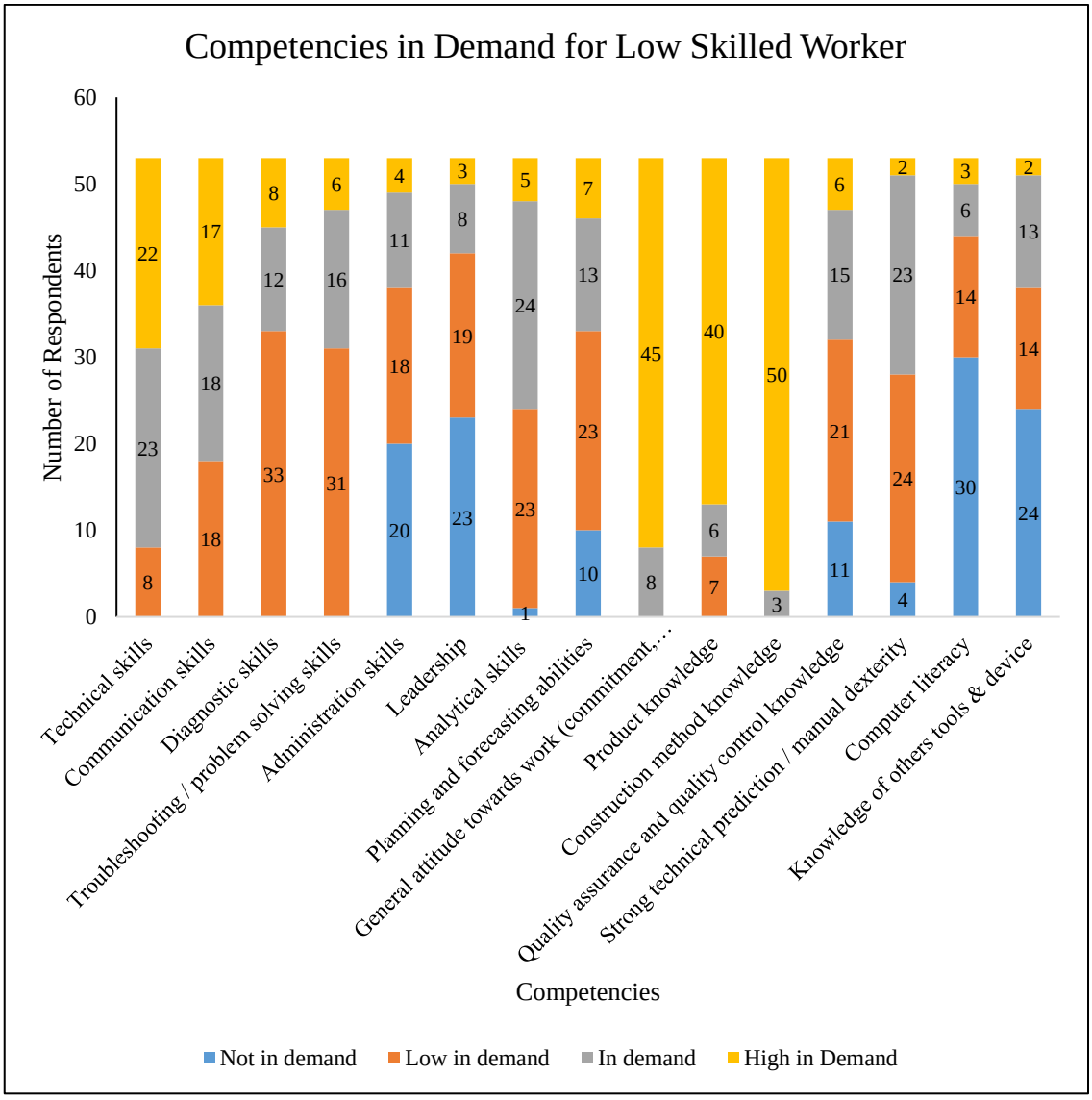

Figure 4.9: Competencies in Demand for Low Skilled Workers

For semi-skilled workers in the construction industry, the main competencies in demand from the survey collected are construction method knowledge (51 respondent agree high in demand), planning and forecasting ability (47 respondent agree high in demand), technical skills (47 respondent agree high in demand), communication skills (45 respondent agree high in demand), leadership (43 respondent agree high in demand) and quality assurance and quality control knowledge (40 respondent agree high in demand). Figure 4.10 below shows the competencies in demand for the semi-skilled workers in the construction industry.

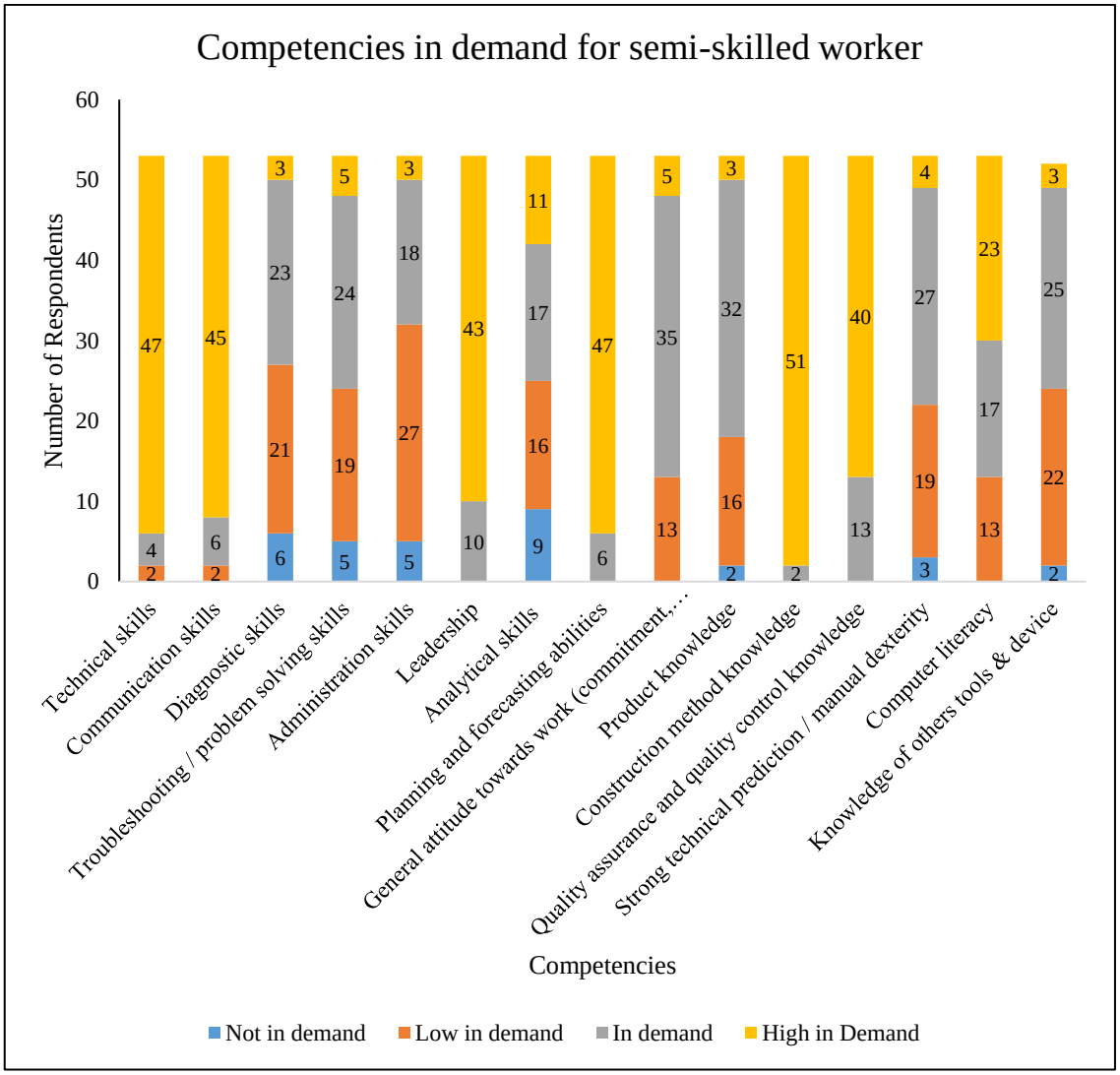

Figure 4.10: Competencies in Demand for Semi-Skilled Workers

Competencies in demand for skilled workers can be seen in Figure 4.11 below. It can be observed that most respondents agreed that the main competencies in demand for skilled workers are computer literacy (49 respondents agreed it is high in demand) followed by communication skills (46 respondents agreed it is high in demand), diagnostic skills (45 respondents agreed it is high in demand), strong technical prediction (47 respondents agreed it is high in demand), leadership (44 respondents agreed it is high in demand) and administration skills (43 respondents agreed it is high in demand).

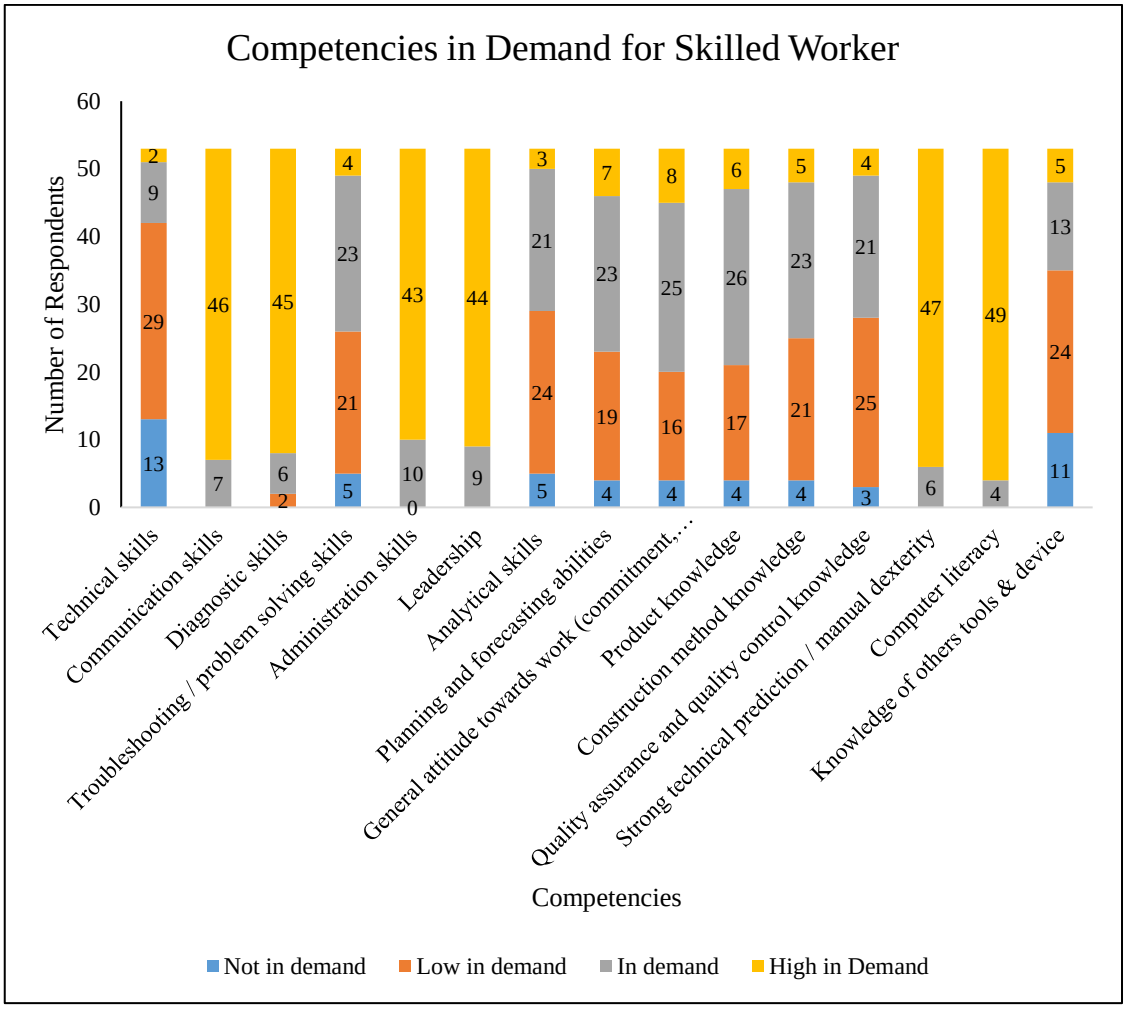

Figure 4.11: Competencies in Demand for Skilled Workers

Besides that, during the focus group discussion, several competencies listed were discussed regarding the factors contributing to the demand and the solutions needed to increase the competencies for workers in the industry. The results are listed in Table 4.5 below.

Table 4.5: Competencies in Demand for Construction of Buildings Industry

NO.	COMPETENCIES IN DEMAND	FACTOR(S) CONTRIBUTING TO THE DEMAND	SOLUTIONS
1)	a) Leadership skills b) Communication skills	a) No structured system to transfer	a) Training on related or similar areas.

NO.	COMPETENCIES IN DEMAND	FACTOR(S) CONTRIBUTING TO THE DEMAND	SOLUTIONS
	c) Administration skills d) Planning and Forecasting abilities e) Quality assurance and quality control knowledge f) Strong technical prediction / manual dexterity	skill to new successor. b) Lack of exposure on process. c) Lack of hands-on experience on process.	b) Review of training syllabus at training centre/ provider. c) Review of training delivery mode (example applying dual system training). d) Joint venture with industry players to provide facilities and exposure. e) Invite industry players to jointly carry out R&D programs.
2)	a) Troubleshooting / problem solving skills b) Analytical skills c) General attitude towards work d) Product knowledge e) Construction method knowledge	a) Lack of hands-on practical experience. b) Perceived as 3D job. c) Lack of youth involvement.	a) Training on related or similar areas. b) Review of training syllabus at training centre/ provider. c) Joint venture with industry players to provide facilities and exposure. d) Invite industry players to jointly carry out R&D programmes.

4.2.4 Emerging Skills

The expansion of Industrial Revolution 4.0 into construction of buildings industry will gradually change the current situation of construction industry. From the survey distributed, most of the respondents agreed that IR4.0 will mostly affect the industrialised building system compared to conventional construction industry as can be seen in Figure 4.12 below. IBS will be affected by autonomous robots, big data analytics, cloud computing, internet of things, additive manufacturing, system integration and simulation. While conventional construction will mostly be affected by cloud computing.

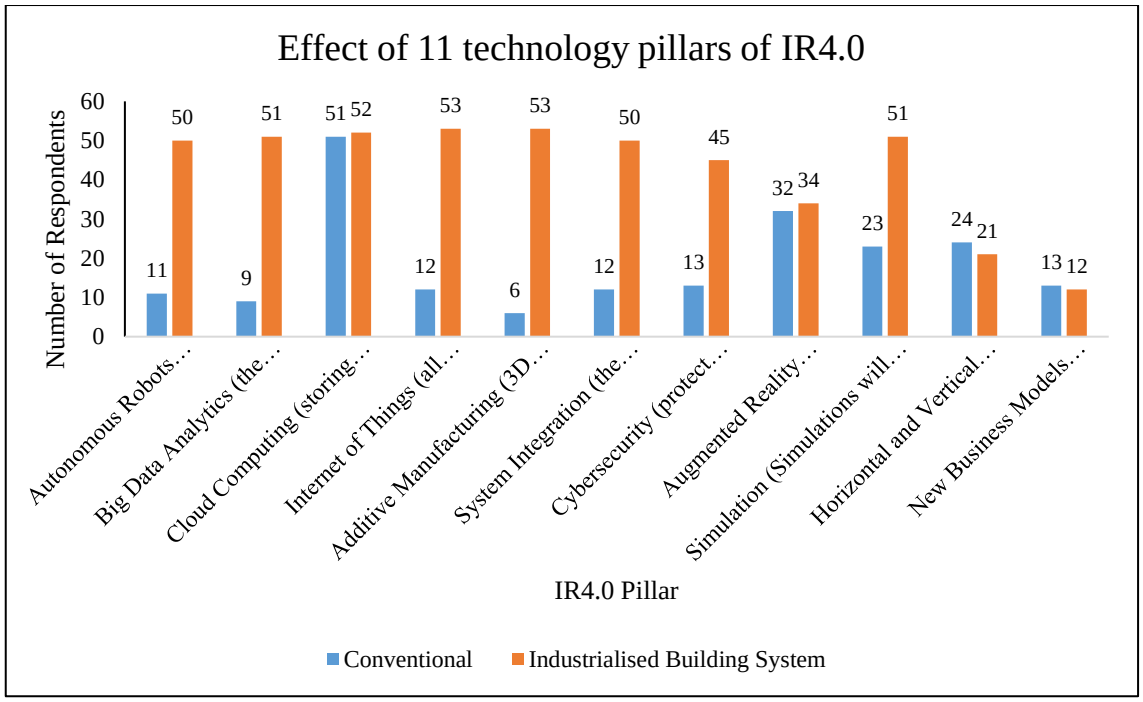

Figure 4.12: Effect of 11 technology pillars of IR4.0

As a result of the effects of IR4.0 on the construction of buildings industry, new skills have emerged to adapt to the revolution. During the focus group discussion, some job titles that are related to IR4.0 and the reasons for the required emerging skills were discussed as listed in Table 4.6 below.

Table 4.6: Emerging Skills for Construction of Buildings Industry

No.	EMERGING SKILLS	JOB TITLES RELATED TO IR4.0	REASONS FOR REQUIRED EMERGING SKILLS
1	IR4.0 related skills – a) Autonomous robots b) Big data analytics c) Cloud computing d) Internet of things e) Additive manufacturing f) System integration g) Simulation h) Cloud computing	a) Project director b) Project manager c) Construction manager d) Engineer e) Coordinator f) Supervisor	a) Increase productivity, reduce cost and improve efficiency. b) Minimise human error. c) Fast decision making. d) Increase process effectiveness.

4.2.5 Related Issues for Construction of Buildings Industry

Several related issues regarding the construction of buildings industry were identified during the focus group discussion. These issues were included in the survey that was distributed to clarify which issues give the most effect to the industry. Figure 4.13 shows the responses for the related issues in the construction of buildings industry obtained from the survey distributed. Based on the results, the most important issues regarding construction of buildings are high dependency on foreign labour, youth involvement, economic condition, insufficient manpower, low skilled and low performance workforce and inconsistency in materials supply and price.

The issues related to the construction of buildings industry were then discussed to identify why and how to overcome them. The main reason for the issues related to the construction of buildings which are lack of youth involvement and insufficient manpower is because this industry are considered as 3D jobs and have a negative perception by the Malaysian community. Due to these, the dependency on foreign labour in this industry

had worsened. To overcome the problem, several suggestions have been given such as increase the minimum wage, enhancement of awareness and promotional activity and continuous effort from both government and private sector to control the intake of foreign labour and attract more local workers. The discussion can be seen in the following Table 4.7.

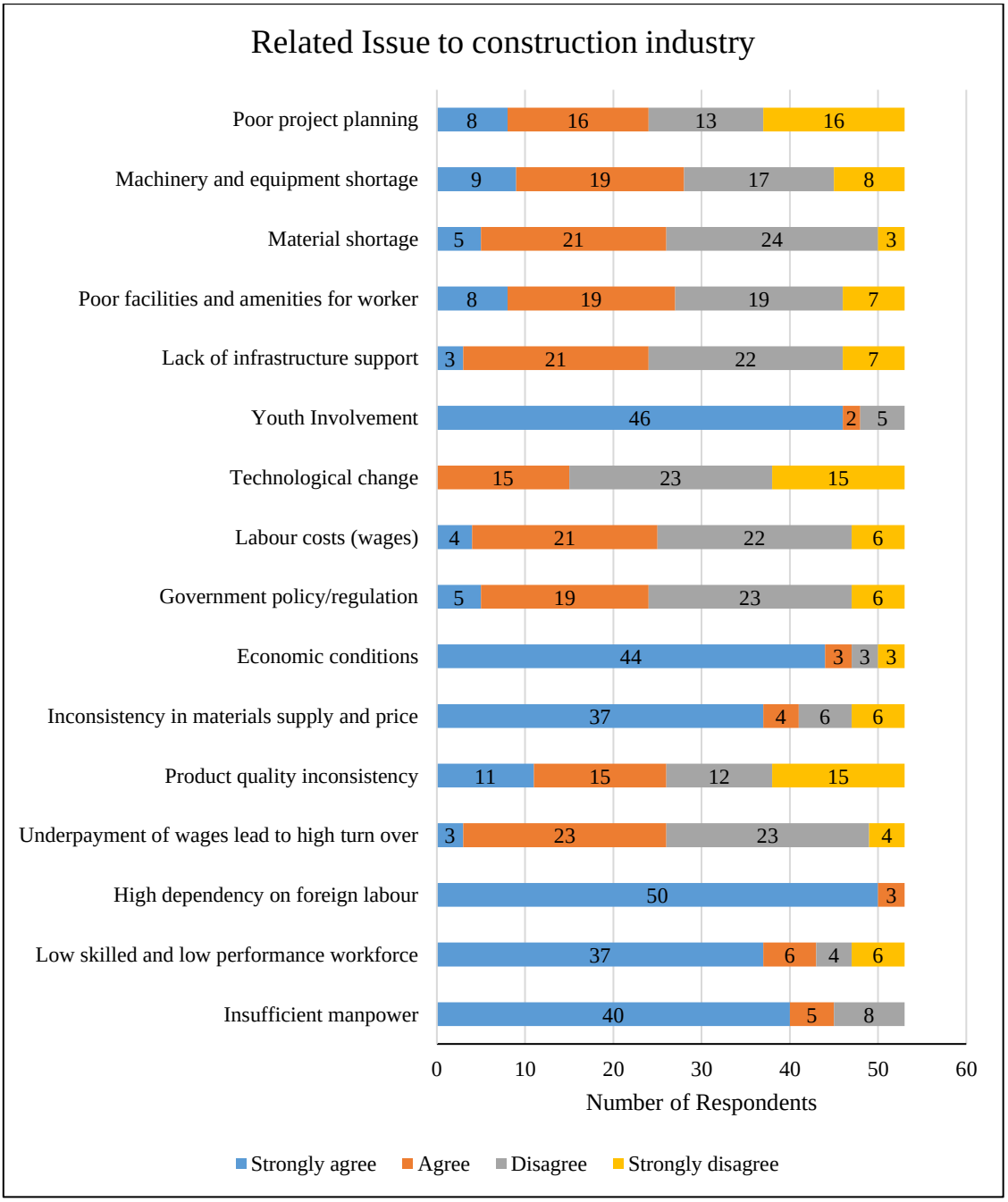

Figure 4.13: Issues Related to Construction of Buildings

Table 4.7: Discussion on Issues Related to the Construction of Buildings Industry

NO.	KEY ISSUES	DISCUSSION	SUGGESTIONS
1.	Insufficient manpower	a) Demanding work condition. b) 3D (Dirty, Dangerous, Difficult). c) Unattractive wages and fringe benefits. d) Negative perception by community.	a) Minimum wage policy. b) Review wages scheme such as productivity based remuneration.
2.	High dependency on foreign labour	a) 3D (Dirty, Dangerous, Difficult). b) Reliable and favourable for higher productivity than local workers. c) Inability to convince young generation to participate in construction sector.	Both government and private sectors should give concerted and continuous effort in controlling the intake of foreign labours and attract more locals.
3.	Underpayment of wages lead to high turn over	Salary and wages do not match with productivity and job requirements.	Profit sharing – changing the mindset of the management to create a harmonised salary scheme.
4.	Low quality products- Quality Control	Low productivity and quality.	a) Quality enhancement by upgrading more skilled workers.

NO.	KEY ISSUES	DISCUSSION	SUGGESTIONS
			b) SOP enforcement by private sector.
5.	Economic conditions	Low investment from government and private sectors.	a) Enforcement from related government agencies b) Diversification of economic activities.
6.	Labour costs (sub-contractors)	a) The commission percentage is too high. b) Intense outsourcing contracts in the construction activities.	a) Direct contracts awards. b) Improvement of procurement procedure.
7.	Youth Involvement	a) Poor technology adoption and advancement. b) Negative perception c) 3D (Dirty, Dangerous, Difficult).	a) Enhancement of awareness and promotional activity. b) Integration of skills training and learning.
8.	Lack of infrastructure support	Incomplete infrastructure especially in rural areas.	Government policies and intervention together with proactive involvement of the industry players.

4.3 Comparative Study Analysis

In the comparative study analysis for the construction industry, three countries are chosen to make a comparative overview with the industry in Malaysia. The countries chosen are United States of America (USA), United Kingdom and Indonesia.

a) United States of America (USA)

Construction is a major contributor to the United States economy. The industry has more than 6.71 million employees and creates nearly $1.3 trillion worth of structures each year[53].

Briefly, construction saw a big increase in private housing, a key driver of this year's expansion. Private construction costs continued to grow, reaching USD963 billion in 2017 compare to USD899 billion in 2016. While value of construction for public sector in 2017 decrease to USD283 billion compare to USD292 billion in 2016.

The total value of construction in USA shows a constant increase in value from 2011 with a total of USD788 billion to USD1,246 billion in 2017 as shown in Figure 4.11. One key factor predicted to ensure continued growth in the construction industry is the Tax Cuts and Jobs Act of 2017 and the potential infrastructure spending to follow[54].

[53] Construction Workforce in United States (2019, August 25) Retrieved from *https://datausa.io*
[54] Construction growth trajectory in United States (2019, August 25) Retrieved from https://www.constructionbusinessowner.com/accounting/accounting-finance/construction-industrys-growth-trajectory

Figure 4.14: Construction spending in the United States from 2011 to 2018 (Source: https:// www.statista.com,2019)

b) United Kingdom

The value of construction in current prices continued to rise in 2017 in the United Kingdom, reaching its highest level on record at £109,387 million (USD134.4 billion) compared to only £99,448 million in 2016. These is driven by growth in the private sector, which equates to approximately three-quarters of the value[55].

The number of firms operating in the construction industry has continued to rise, increasing by 6.2% from 296,093 firms in 2016 to 314,590 firms operating in the United Kingdom in 2017. From that value, a total of 281,931 firms has been registered in England compared with only 20,081 firms in Scotland and 12,578 firms in Wales.

Construction-related employment in the construction industry has experienced a steady increase since 2014, which has continued in 2017. Total employment in the United Kingdom increased by 3.8% to 1.323 million people in 2017 compared to 1.274 million in 2016, exceeding its pre-downturn peak

[55] Value of Construction in United Kingdom (2019, August 25) Retrieved from http://datumpoint.org.uk/challenges-facing-uk-construction-industry-2019

of 2007 (1.286 million) to reach the highest level on record with total jobs centered around London, the South East and the North West of England[56]. Figure 4.15 shows the statistics of construction sector in the United Kingdom for 2016 and 2017.

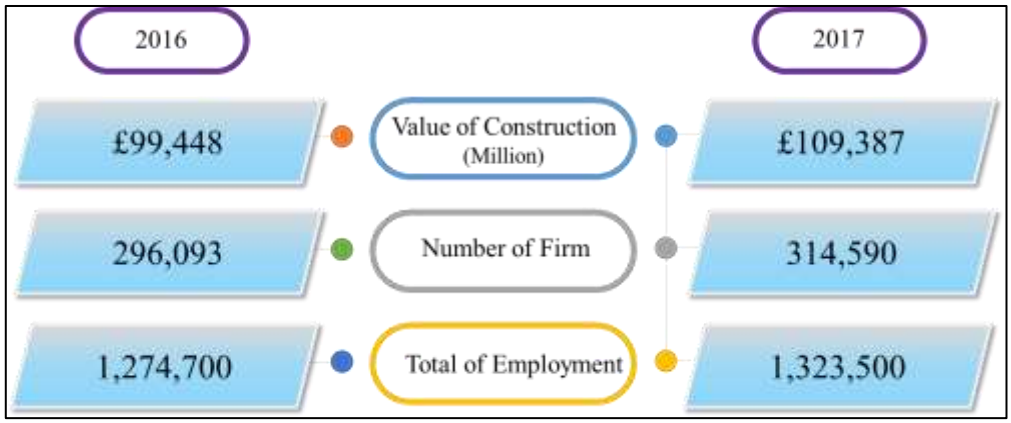

Figure 4.15: Statistics of Construction Sector in the United Kingdom

c) Indonesia

Since 2015, the Indonesia government has been boosting the infrastructure development. The government's spending on infrastructure increases drastically. However, due to global economic influences, the economic growth of Indonesia is in a slightly steady state but it has improved a little due to the dynamic influenced of infrastructure investment.

The economic growth is expected to increase since the new government has implemented infrastructure projects in the five years of the medium-term expenditure (2015 – 2019) in which infrastructure development has become a key priority of the national economic development

[56] Statistic of Construction in United Kingdom (2019, August 25) Retrieved from https://www.ons.gov.uk/businessindustryandtrade/constructionindustry/articles/constructionstatistics/number192018edition

The new government estimates to push infrastructure investments of 4,886 IDR trillion by which 3,386 IDR trillion are for strategic infrastructures and another 1,500 IDR trillion for basic infrastructures[57].

The value of construction in Indonesia continued to rise in 2017, reaching its highest level on record at 958,015,034 million rupiah (USD67.5 billion) compared to only 839,205,661 million rupiah in 2016. A total number of 155,833 firms has been registered in Indonesia in 2017 (127,521 small firms, 26,904 medium firms and 1,408 large firms) compared to only 142,852 firms in 2016.

Construction-related employment in the construction industry has experienced a steady increase since 2013, which has continued in 2017. Total employment in Indonesia increased by 8.1% to 10,087,740 million people in 2017 compared to 9,331,859 million in 2016. Figure 4.13 shows the statistics of construction sector in Indonesia for 2016 and 2017[58].

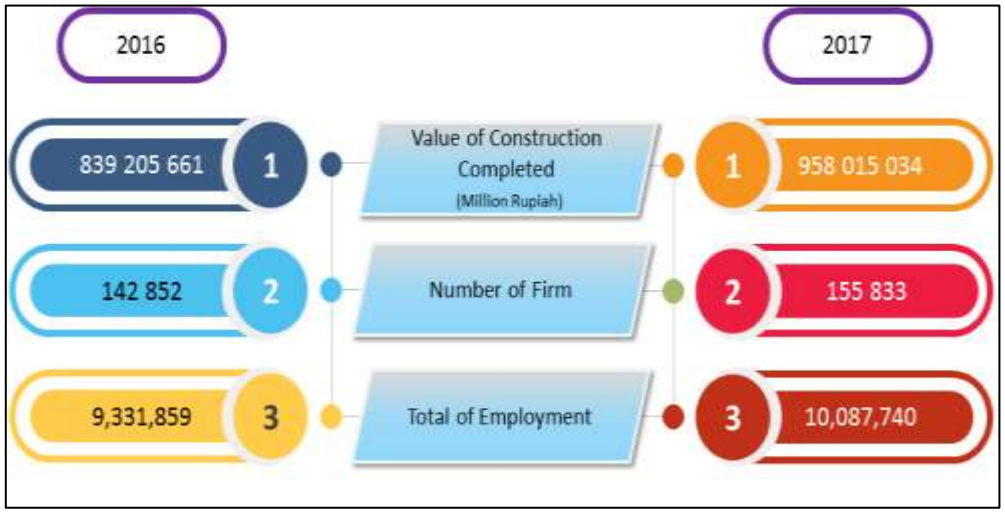

Figure 4.16: Statistics of construction sector in Indonesia for 2016 and 2017

[57] Suraji, A. The Construction Sector of Indonesia. (2019, October 2). Retrieved from https://www.cidb.gov.my
[58] Statistic of Construction in Indonesia (2019, October 2). Retrieved from www.bps.go.id

d) Summary of comparative factors

Based on the data mentioned above, a summary of comparative factors for the construction industry in 2017 between Malaysia, the United Kingdom, the United States and Indonesia is listed in Table 4.8 below. It can be seen that USA has the highest value of construction completed at USD1,294 billion with 700,000 number of establishment. While Indonesia has the highest number of employment with 10,087,740 workers.

Table 4.8: Summary of comparative factor for Malaysia, United Kingdom, USA and Indonesia

Comparison Aspect / Country	Value of Construction Completed (USD)	Number of Establishment	Employment Statistics
 **Malaysia**	**48.8 billion**	**40,558**	**1,330,266**
 **United Kingdom**	**134.4 billion**	**314,590**	**1,323,500**
 **United States**	**1,294 billion**	**700,000**	**6,710,000**
 **Indonesia**	**67.5 billion**	**155,833**	**10,087,740**

4.4 Occupational Structure

Occupational Structure (OS) can be described as aggregate distribution of occupations in society, classified according to skill level or economics function. The OS for construction of buildings comprise of 16 job area which are form work (pile cap), rebar/spacer (pile cap), concreting (pile cap), form work (ground beam), rebar/spacer (ground beam), concreting (ground beam), form work (in situ work), rebar/spacer (in situ work), concreting (in situ work), cutting/welding (steel work), installation (steel work), cutting/joining (timber work), installation (timber work), IBS reusable formwork, IBS blockwork and IBS precast concrete.

Based on the discussion with the expert panel from the construction of buildings industry, a total of 16 job areas are listed out with 128 job titles related to this industry. The results are listed in the Table 4.9 to Table 4.14. Besides that, critical job titles are identified in all construction of buildings job area. Many factors contribute to the identification of critical job such as lack of local talents or inadequate skills of current workers. Therefore, proper training programs for this critical jobs need to be developed and implemented according to industry standards and requirement. Jobs relevant to IR4.0 were also identified by the expert panel from the construction of buildings industry. These jobs normally can be seen in IBS construction where they are using high technologies to construct buildings part. The summary of the finding including with the critical job titles and job titles relevant to IR4.0 are listed in Table 4.15. Most of the critical job titles in construction of buildings industry are from level 2, level 3 and level 4.

Table 4.9: Group 410 Occupational Structure (1 of 6)

SECTION	**(F) CONSTRUCTION**		
DIVISION	**(41) CONSTRUCTION OF BUILDINGS**		
GROUP	**(410) CONSTRUCTION OF BUILDINGS**		
AREA	**Form Work (Pile Cap)**	**Rebar / Spacer (Pile Cap)**	**Concreting (Pile Cap)**
LEVEL 8	Project Director	Project Director	Project Director
LEVEL 7	Project Manager	Project Manager	Project Manager
LEVEL 6	Construction Manager	Construction Manager	Construction Manager
LEVEL 5	Engineer	Engineer	Engineer
LEVEL 4	Coordinator*	Coordinator*	Coordinator*
LEVEL 3	Supervisor*	Supervisor*	Supervisor*
LEVEL 2	Carpenter*	Bar bender*	Concreter*
LEVEL 1	General Worker	General Worker	General Worker

Note: *Critical Job Titles

Table 4.10: Group 410 Occupational Structure (2 of 6)

SECTION	(F) CONSTRUCTION		
DIVISION	(41) CONSTRUCTION OF BUILDINGS		
GROUP	(410) CONSTRUCTION OF BUILDINGS		
AREA	**Form Work (Ground Beam)**	**Rebar / Spacer (Ground Beam)**	**Concreting (Ground Beam)**
LEVEL 8	Project Director	Project Director	Project Director
LEVEL 7	Project Manager	Project Manager	Project Manager
LEVEL 6	Construction Manager	Construction Manager	Construction Manager
LEVEL 5	Engineer	Engineer	Engineer
LEVEL 4	Coordinator*	Coordinator*	Coordinator*
LEVEL 3	Supervisor*	Supervisor*	Supervisor*
LEVEL 2	Carpenter*	Bar bender*	Concreter*
LEVEL 1	General Worker	General Worker	General Worker

Note: *Critical Job Titles

Table 4.11: Group 410 Occupational Structure (3 of 6)

SECTION	(F) CONSTRUCTION		
DIVISION	(41) CONSTRUCTION OF BUILDINGS		
GROUP	(410) CONSTRUCTION OF BUILDINGS		
AREA	**Form Work (In Situ Work)**	**Rebar / Spacer (In Situ Work)**	**Concreting (In Situ Work)**
LEVEL 8	Project Director	Project Director	Project Director
LEVEL 7	Project Manager	Project Manager	Project Manager
LEVEL 6	Construction Manager	Construction Manager	Construction Manager
LEVEL 5	Engineer	Engineer	Engineer
LEVEL 4	Coordinator*	Coordinator*	Coordinator*
LEVEL 3	Supervisor*	Supervisor*	Supervisor*
LEVEL 2	Carpenter*	Bar bender*	Concreter*
LEVEL 1	General Worker	General Worker	General Worker

Note: *Critical Job Titles

Table 4.12: Group 410 Occupational Structure (4 of 6)

SECTION	**(F) CONSTRUCTION**	
DIVISION	**(41) CONSTRUCTION OF BUILDINGS**	
GROUP	**(410) CONSTRUCTION OF BUILDINGS**	
AREA	**Cutting / Welding (Steel Work)**	**Installation (Steel Work)**
LEVEL 8	Project Director	Project Director
LEVEL 7	Project Manager	Project Manager
LEVEL 6	Construction Manager	Construction Manager
LEVEL 5	Engineer	Engineer
LEVEL 4	Coordinator*	Coordinator*
LEVEL 3	Foreman*	Supervisor*
LEVEL 2	Welder*	Installer*
LEVEL 1	Helper	Helper

Note: *Critical Job Titles

Table 4.13: Group 410 Occupational Structure (5 of 6)

SECTION	(F) CONSTRUCTION	
DIVISION	(41) CONSTRUCTION OF BUILDINGS	
GROUP	(410) CONSTRUCTION OF BUILDINGS	
AREA	**Cutting / Joining (Timber Work)**	**Installation (Timber Work)**
LEVEL 8	Project Director	Project Director
LEVEL 7	Project Manager	Project Manager
LEVEL 6	Construction Manager	Construction Manager
LEVEL 5	Engineer	Engineer
LEVEL 4	Coordinator*	Coordinator*
LEVEL 3	Supervisor*	Supervisor*
LEVEL 2	Joiner*	Installer*
LEVEL 1	Helper	Helper

Note: *Critical Job Titles

Table 4.14: Group 410 Occupational Structure (6 of 6)

SECTION	(F) CONSTRUCTION		
DIVISION	(41) CONSTRUCTION OF BUILDINGS		
GROUP	(410) CONSTRUCTION OF BUILDINGS		
AREA	IBS Reusable Formwork	IBS Blockwork	IBS Precast Concrete System
LEVEL 8	Project Director**	Project Director**	Project Director**
LEVEL 7	Project Manager**	Project Manager**	Project Manager**
LEVEL 6	Construction Manager**	Construction Manager**	Construction Manager**
LEVEL 5	Engineer**	Engineer**	Engineer**
LEVEL 4	Coordinator***	Coordinator***	Coordinator***
LEVEL 3	Supervisor***	Supervisor***	Supervisor***
LEVEL 2	Installer*	Installer*	Installer*
LEVEL 1	General Worker	General Worker	General Worker

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

Table 4.15: Summary of Job Titles

No	Job Area	Level								Total Identified Job Titles	Total Critical Job Titles	Total IR4.0 Job Title
		1	2	3	4	5	6	7	8			
1)	Form work (Pile cap)	1	1	1	1	1	1	1	1	8	3	-
2)	Rebar / Spacer (Pile cap)	1	1	1	1	1	1	1	1	8	3	-
3)	Concreting (Pile cap)	1	1	1	1	1	1	1	1	8	3	-
4)	Form work (Ground Beam)	1	1	1	1	1	1	1	1	8	3	-
5)	Rebar / Spacer (Ground Beam)	1	1	1	1	1	1	1	1	8	3	-
6)	Concreting (Ground Beam)	1	1	1	1	1	1	1	1	8	3	-
7)	Form work (In Situ Work)	1	1	1	1	1	1	1	1	8	3	-
8)	Rebar / Spacer (In Situ Work)	1	1	1	1	1	1	1	1	8	3	-
9)	Concreting (In Situ Work)	1	1	1	1	1	1	1	1	8	3	-
10)	Cutting / Welding (Steel Work)	1	1	1	1	1	1	1	1	8	3	-
11)	Installation (Steel Work)	1	1	1	1	1	1	1	1	8	3	-
12)	Cutting / Joining (Timber Work)	1	1	1	1	1	1	1	1	8	3	-
13)	Installation (Timber Work)	1	1	1	1	1	1	1	1	8	3	-

14)	IBS Reusable Formwork	1	1	1	1	1	1	1	1	8	3	6
15)	IBS Blockwork	1	1	1	1	1	1	1	1	8	3	6
16)	IBS Precast Concrete	1	1	1	1	1	1	1	1	8	3	6
Total Job Title										128	48	18

4.5 Occupational Responsibilities

From the occupational structure produced, each job title's responsibilities which may include but not limited to the list were discussed with the expert from construction industry during the focus group discussion. These occupational responsibilities are intended to be referred for NOSS development. The information discussed are listed in Table 4.16 to Table 4.21.

DIVISION 41: CONSTRUCTION OF BUILDINGS

GROUP 410: CONSTRUCTION OF BUILDINGS

Table 4.16: List of Responsibilities for Group 410 Based on Table 4.9 (1 of 6)

AREA	Form Work (Pile Cap)	Rebar / Spacer (Pile Cap)	Concreting (Pile Cap)
LEVEL 8	**Project Director** 1) Develop a timeline for the completion for a certain milestone for a given project. 2) Monitor project progress, provide financial control and expenses as well as ensure project quality. 3) Recommend changes to project that is ongoing if it appears not proceeding according to schedule or scope of work.	**Project Director** 1) Develop a timeline for the completion for a certain milestone for a given project. 2) Monitor project progress, provide financial control and expenses as well as ensure project quality. 3) Recommend changes to project that is ongoing if it appears not proceeding according to schedule or scope of work.	**Project Director** 1) Develop a timeline for the completion for a certain milestone for a given project. 2) Monitor project progress, provide financial control and expenses as well as ensure project quality. 3) Recommend changes to project that is ongoing if it appears not proceeding according to schedule or scope of work.

AREA	Form Work (Pile Cap)	Rebar / Spacer (Pile Cap)	Concreting (Pile Cap)
	4) Develop an alternative cost of action to execute or expedite process or progress. 5) Present proposal to client and stakeholder on financial standing and team readiness. 6) Perform regular meeting with client, third parties, and project manager to report progress. 7) Build strong relationship with client. 8) Make strategic decision and provide necessary leadership and direction for teams of project managers to implement those decisions.	4) Develop an alternative cost of action to execute or expedite process or progress. 5) Present proposal to client and stakeholder on financial standing and team readiness. 6) Perform regular meeting with client, third parties, and project manager to report progress. 7) Build strong relationship with client. 8) Make strategic decision and provide necessary leadership and direction for teams of project managers to implement those decisions.	4) Develop an alternative cost of action to execute or expedite process or progress. 5) Present proposal to client and stakeholder on financial standing and team readiness. 6) Perform regular meeting with client, third parties, and project manager to report progress. 7) Build strong relationship with client. 8) Make strategic decision and provide necessary leadership and direction for teams of project managers to implement those decisions.
LEVEL 7	**Project Manager** 1) Approve project cost to stay within project limits. 2) Approve developed scope of work and project function. 3) Verify overall project status report and present to project team management and client.	**Project Manager** 1) Approve project cost to stay within project limits. 2) Approve developed scope of work and project function. 3) Verify overall project status report and present to project team management and client.	**Project Manager** 1) Approve project cost to stay within project limits. 2) Approve developed scope of work and project function. 3) Verify overall project status report and present to project team management and client.

AREA	Form Work (Pile Cap)	Rebar / Spacer (Pile Cap)	Concreting (Pile Cap)
	4) Update project progress or status to top management and client. 5) Verify project documentation such as diagram, masterplan, overall work program. 6) Approve design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement. 7) Request for approval design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement (conventional). 8) Approve request for information (RFIn) to clarify uncertainties. 9) Verify works of sub-contractors to ensure quality and conformance to design specifications, budget allocation and client requirement.	4) Update project progress or status to top management and client. 5) Verify project documentation such as diagram, masterplan, overall work program. 6) Approve design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement. 7) Request for approval design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement (conventional). 8) Approve request for information (RFIn) to clarify uncertainties. 9) Verify works of sub-contractors to ensure quality and conformance to design specifications, budget allocation and client requirement.	4) Update project progress or status to top management and client. 5) Verify project documentation such as diagram, masterplan, overall work program. 6) Approve design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement. 7) Request for approval design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement (conventional). 8) Approve request for information (RFIn) to clarify uncertainties. 9) Verify works of sub-contractors to ensure quality and conformance to design specifications, budget allocation and client requirement.

AREA	Form Work (Pile Cap)	Rebar / Spacer (Pile Cap)	Concreting (Pile Cap)
	10) Liaise and negotiate with consultant for project progress deadline and matters arising. 11) Initiate program or instruct construction site manager to conform with safety, health and environmental officer to ensure compliance with regulation. 12) Lead project team to meet project objectives and scopes of work within budget allocated. 13) Perform risk management activities to minimize project risk. 14) Represent company in meetings.	10) Liaise and negotiate with consultant for project progress deadline and matters arising. 11) Initiate program or instruct construction site manager to conform with safety, health and environmental officer to ensure compliance with regulation. 12) Lead project team to meet project objectives and scopes of work within budget allocated. 13) Perform risk management activities to minimize project risk. 14) Represent company in meetings.	10) Liaise and negotiate with consultant for project progress deadline and matters arising. 11) Initiate program or instruct construction site manager to conform with safety, health and environmental officer to ensure compliance with regulation. 12) Lead project team to meet project objectives and scopes of work within budget allocated. 13) Perform risk management activities to minimize project risk. 14) Represent company in meetings.
LEVEL 6	**Construction Manager** 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 term of functionality, buildability,	**Construction Manager** 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 term of functionality, buildability,	**Construction Manager** 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 term of functionality, buildability,

AREA	Form Work (Pile Cap)	Rebar / Spacer (Pile Cap)	Concreting (Pile Cap)
	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 requirement. 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.	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 requirement. 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.	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 requirement. 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.

AREA	Form Work (Pile Cap)	Rebar / Spacer (Pile Cap)	Concreting (Pile Cap)
	11) Coordinate construction work according to Inspection Test Plan. 12) Ensure safety, health and environment (SHE) compliance. 13) Represent company in meetings.	11) Coordinate construction work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings.	11) Coordinate construction work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings.
LEVEL 5	**Engineer** 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. 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.	**Engineer** 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. 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.	**Engineer** 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. 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.

AREA	Form Work (Pile Cap)	Rebar / Spacer (Pile Cap)	Concreting (Pile Cap)
	8) Prepare master work program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor or related worker. 10) Identify and report any errors or discrepancies on construction drawing/shop drawing. 11) Propose technical solution 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 drawing.	8) Prepare master work program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor or related worker. 10) Identify and report any errors or discrepancies on construction drawing/shop drawing. 11) Propose technical solution 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 drawing.	8) Prepare master work program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor or related worker. 10) Identify and report any errors or discrepancies on construction drawing/shop drawing. 11) Propose technical solution 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 drawing.

AREA	Form Work (Pile Cap)	Rebar / Spacer (Pile Cap)	Concreting (Pile Cap)
LEVEL 4	**Coordinator** 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 drawing, specification and bill of quantity (BQ). 5) Coordinate and inspect shop drawing production. 6) Assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing. 7) Identify variation order. 8) Assist in preparing progress claim for construction work. 9) Attend technical and site meetings. 10) Identify and solve interfacing problem. 11) Assist in producing as-built drawing.	**Coordinator** 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 drawing, specification and bill of quantity (BQ). 5) Coordinate and inspect shop drawing production. 6) Assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing. 7) Identify variation order. 8) Assist in preparing progress claim for construction work. 9) Attend technical and site meetings. 10) Identify and solve interfacing problem. 11) Assist in producing as-built drawing.	**Coordinator** 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 drawing, specification and bill of quantity (BQ). 5) Coordinate and inspect shop drawing production. 6) Assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing. 7) Identify variation order. 8) Assist in preparing progress claim for construction work. 9) Attend technical and site meetings. 10) Identify and solve interfacing problem. 11) Assist in producing as-built drawing.

AREA	Form Work (Pile Cap)	Rebar / Spacer (Pile Cap)	Concreting (Pile Cap)
LEVEL 3	**<u>Supervisor</u>** 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 hazard and risk.	**<u>Supervisor</u>** 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 hazard and risk.	**<u>Supervisor</u>** 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 hazard and risk.

AREA	Form Work (Pile Cap)	Rebar / Spacer (Pile Cap)	Concreting (Pile Cap)
	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 requirement. 19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities including QA QC documents, SHE documents.	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 requirement. 19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities including QA QC documents, SHE documents.	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 requirement. 19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities including QA QC documents, SHE documents.
LEVEL 2	**Carpenter** 1) Perform work as per method statement. 2) Carry out timber work. 3) Measure, mark or record measurements.	**Bar bender** 1) Request for reinforcement bar storage area. 2) Maintain and upkeep hand tools, reinforcement bar and bar bending machine. 3) Prepare bar bending work bench.	**Concreter** 1) Perform work as per construction drawing and method statement. 2) Carry out concreting work. 3) Carry out loading and unloading of material.

AREA	Form Work (Pile Cap)	Rebar / Spacer (Pile Cap)	Concreting (Pile Cap)
	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 standard operating procedure. 9) Update daily work report.	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. 11) Perform work as per construction drawing and method statement.	4) Carry out concreting work related to water proofing. 5) Assist in carrying out sample testing. 6) Assist in taking concrete sample for testing. 7) Carry out concrete mixing. 8) Handle tools and equipment. 9) Perform routine maintenance.
LEVEL 1	**General Worker** 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.	**General Worker** 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.	**General Worker** 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.

AREA	Form Work (Pile Cap)	Rebar / Spacer (Pile Cap)	Concreting (Pile Cap)
	7) Perform housekeeping. 8) Adhere to safety health and environment regulation.	7) Perform housekeeping. 8) Adhere to safety health and environment regulation.	7) Perform housekeeping. 8) Adhere to safety health and environment regulation.

Table 4.17: List of Responsibilities for Group 410 Based on Table 4.10 (2 of 6)

AREA	Form Work (Ground Beam)	Rebar / Spacer (Ground Beam)	Concreting (Ground Beam)
LEVEL 8	**Project Director** 1) Develop a timeline for the completion for a certain milestone for a given project. 2) Monitor project progress, provide financial control and expenses as well as ensure project quality. 3) Recommend changes to project that is ongoing if it appears not proceeding according to schedule or scope of work. 4) Develop an alternative cost of action to execute or expedite process or progress. 5) Present proposal to client and stakeholder on financial standing and team readiness. 6) Perform regular meeting with client, third parties, and project manager to report progress. 7) Build strong relationship with client.	**Project Director** 1) Develop a timeline for the completion for a certain milestone for a given project. 2) Monitor project progress, provide financial control and expenses as well as ensure project quality. 3) Recommend changes to project that is ongoing if it appears not proceeding according to schedule or scope of work. 4) Develop an alternative cost of action to execute or expedite process or progress. 5) Present proposal to client and stakeholder on financial standing and team readiness. 6) Perform regular meeting with client, third parties, and project manager to report progress. 7) Build strong relationship with client.	**Project Director** 1) Develop a timeline for the completion for a certain milestone for a given project. 2) Monitor project progress, provide financial control and expenses as well as ensure project quality. 3) Recommend changes to project that is ongoing if it appears not proceeding according to schedule or scope of work. 4) Develop an alternative cost of action to execute or expedite process or progress. 5) Present proposal to client and stakeholder on financial standing and team readiness. 6) Perform regular meeting with client, third parties, and project manager to report progress. 7) Build strong relationship with client.

AREA	Form Work (Ground Beam)	Rebar / Spacer (Ground Beam)	Concreting (Ground Beam)
	8) Make strategic decision and provide necessary leadership and direction for teams of project managers to implement those decisions.	8) Make strategic decision and provide necessary leadership and direction for teams of project managers to implement those decisions.	8) Make strategic decision and provide necessary leadership and direction for teams of project managers to implement those decisions.
LEVEL 7	**<u>Project Manager</u>** 1) Approve project cost to stay within project limits. 2) Approve developed scope of work and project function. 3) Verify overall project status report and present to project team management and client. 4) Update project progress or status to top management and client. 5) Verify project documentation such as diagram, masterplan, overall work program. 6) Approve design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement.	**<u>Project Manager</u>** 1) Approve project cost to stay within project limits. 2) Approve developed scope of work and project function. 3) Verify overall project status report and present to project team management and client. 4) Update project progress or status to top management and client. 5) Verify project documentation such as diagram, masterplan, overall work program. 6) Approve design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement.	**<u>Project Manager</u>** 1) Approve project cost to stay within project limits. 2) Approve developed scope of work and project function. 3) Verify overall project status report and present to project team management and client. 4) Update project progress or status to top management and client. 5) Verify project documentation such as diagram, masterplan, overall work program. 6) Approve design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement.

AREA	Form Work (Ground Beam)	Rebar / Spacer (Ground Beam)	Concreting (Ground Beam)
	7) Request for approval design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement (conventional). 8) Approve request for information (RFIn) to clarify uncertainties. 9) Verify works of sub-contractors to ensure quality and conformance to design specifications, budget allocation and client requirement. 10) Liaise and negotiate with consultant for project progress deadline and matters arising. 11) Initiate program or instruct construction site manager to conform with safety, health and environmental officer to ensure compliance with regulation. 12) Lead project team to meet project objectives and scopes of work within budget allocated. 13) Perform risk management activities to minimize project risk	7) Request for approval design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement (conventional). 8) Approve request for information (RFIn) to clarify uncertainties. 9) Verify works of sub-contractors to ensure quality and conformance to design specifications, budget allocation and client requirement. 10) Liaise and negotiate with consultant for project progress deadline and matters arising. 11) Initiate program or instruct construction site manager to conform with safety, health and environmental officer to ensure compliance with regulation. 12) Lead project team to meet project objectives and scopes of work within budget allocated. 13) Perform risk management activities to minimize project risk.	7) Request for approval design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement (conventional). 8) Approve request for information (RFIn) to clarify uncertainties. 9) Verify works of sub-contractors to ensure quality and conformance to design specifications, budget allocation and client requirement. 10) Liaise and negotiate with consultant for project progress deadline and matters arising. 11) Initiate program or instruct construction site manager to conform with safety, health and environmental officer to ensure compliance with regulation. 12) Lead project team to meet project objectives and scopes of work within budget allocated. 13) Perform risk management activities to minimize project risk.

AREA	Form Work (Ground Beam)	Rebar / Spacer (Ground Beam)	Concreting (Ground Beam)
	14) Represent company in meetings.	14) Represent company in meetings.	14) Represent company in meetings.
LEVEL 6	**Construction Manager** 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 term 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 programme. 6) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.	**Construction Manager** 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 term 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 programme. 6) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.	**Construction Manager** 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 term 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 programme. 6) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.

AREA	Form Work (Ground Beam)	Rebar / Spacer (Ground Beam)	Concreting (Ground Beam)
	7) Inspect or review project deliverables to monitor compliance with requirement. 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 construction work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings.	7) Inspect or review project deliverables to monitor compliance with requirement. 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 construction work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings.	7) Inspect or review project deliverables to monitor compliance with requirement. 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 construction work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings.

AREA	Form Work (Ground Beam)	Rebar / Spacer (Ground Beam)	Concreting (Ground Beam)
LEVEL 5	**<u>Engineer</u>** 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. 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 master work program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor or related worker.	**<u>Engineer</u>** 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. 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 master work program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor or related worker.	**<u>Engineer</u>** 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. 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 master work program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor or related worker.

AREA	Form Work (Ground Beam)	Rebar / Spacer (Ground Beam)	Concreting (Ground Beam)
	10) Identify and report any errors or discrepancies on construction drawing/shop drawing. 11) Propose technical solution 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 drawing.	10) Identify and report any errors or discrepancies on construction drawing/shop drawing. 11) Propose technical solution 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 drawing.	10) Identify and report any errors or discrepancies on construction drawing/shop drawing. 11) Propose technical solution 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 drawing.
LEVEL 4	**Coordinator** 1) Plan physical work activities. 2) Compile and analyse submissions by site supervisor. 3) Submit technical report and progress report and issue to superior.	**Coordinator** 1) Plan physical work activities. 2) Compile and analyse submissions by site supervisor. 3) Submit technical report and progress report and issue to superior.	**Coordinator** 1) Plan physical work activities. 2) Compile and analyse submissions by site supervisor. 3) Submit technical report and progress report and issue to superior.

AREA	Form Work (Ground Beam)	Rebar / Spacer (Ground Beam)	Concreting (Ground Beam)
	4) Interpret approved construction drawing, specification and bill of quantity (BQ). 5) Coordinate and inspect shop drawing production. 6) Assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing. 7) Identify variation order. 8) Assist in preparing progress claim for construction work. 9) Attend technical and site meetings. 10) Identify and solve interfacing problem. 11) Assist in producing as-built drawing.	4) Interpret approved construction drawing, specification and bill of quantity (BQ). 5) Coordinate and inspect shop drawing production. 6) Assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing. 7) Identify variation order. 8) Assist in preparing progress claim for construction work. 9) Attend technical and site meetings. 10) Identify and solve interfacing problem. 11) Assist in producing as-built drawing.	4) Interpret approved construction drawing, specification and bill of quantity (BQ). 5) Coordinate and inspect shop drawing production. 6) Assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing. 7) Identify variation order. 8) Assist in preparing progress claim for construction work. 9) Attend technical and site meetings. 10) Identify and solve interfacing problem. 11) Assist in producing as-built drawing.
LEVEL 3	**Supervisor** 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.	**Supervisor** 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.	**Supervisor** 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.

AREA	Form Work (Ground Beam)	Rebar / Spacer (Ground Beam)	Concreting (Ground Beam)
	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 hazard and risk. 13) Report site matters to superior or management. 14) Supervise subordinate work. 15) Supervise compliance of safety, health and environment requirements.	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 hazard and risk. 13) Report site matters to superior or management. 14) Supervise subordinate work. 15) Supervise compliance of safety, health and environment requirements.	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 hazard and risk. 13) Report site matters to superior or management. 14) Supervise subordinate work. 15) Supervise compliance of safety, health and environment requirements.

AREA	Form Work (Ground Beam)	Rebar / Spacer (Ground Beam)	Concreting (Ground Beam)
	16) Arrange for maintenance activities. 17) Perform subordinate appraisal. 18) Conduct training for construction methods, operation of machinery and equipment, site safety requirement. 19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities including QA QC documents, SHE documents.	16) Arrange for maintenance activities. 17) Perform subordinate appraisal. 18) Conduct training for construction methods, operation of machinery and equipment, site safety requirement. 19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities including QA QC documents, SHE documents.	16) Arrange for maintenance activities. 17) Perform subordinate appraisal. 18) Conduct training for construction methods, operation of machinery and equipment, site safety requirement. 19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities including QA QC documents, SHE documents.
LEVEL 2	**Carpenter** 1) Perform work as per method statement; 2) Carry out timber work. 3) measure, mark or record measurements 4) Carry out preparation for testing/inspection. 5) Carry out assembly and installation as per approved construction drawing. 6) Perform routine maintenance.	**Bar bender** 1) Request for reinforcement bar storage area. 2) Maintain and upkeep hand tools, reinforcement bar and bar bending machine. 3) Prepare bar bending work bench. 4) Prepare reinforcement spacer. 5) Perform bar cutting works. 6) Perform bar bending works. 7) Perform reinforcement tying. 8) Perform reinforcement placing.	**Concreter** 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 water proofing. 5) Assist in carrying out sample testing. 6) Assist in taking concrete sample for testing. 7) Carry out concrete mixing.

AREA	Form Work (Ground Beam)	Rebar / Spacer (Ground Beam)	Concreting (Ground Beam)
	7) Adhere to safety and security procedure. 8) Follow standard operating procedure. 9) Update daily work report.	9) Perform reinforcement spacer placing. 10) Perform housekeeping.	8) Handle tools and equipment. 9) Perform routine maintenance.
LEVEL 1	**General Worker** 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.	**General Worker** 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.	**General Worker** 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 4.18: List of Responsibilities for Group 410 Based on Table 4.11 (3 of 6)

AREA	Form Work (In Situ Work)	Rebar / Spacer (In Situ Work)	Concreting (In Situ Work)
LEVEL 8	**Project Director** 1) Develop a timeline for the completion for a certain milestone for a given project. 2) Monitor project progress, provide financial control and expenses as well as ensure project quality. 3) Recommend changes to project that is ongoing if it appears not proceeding according to schedule or scope of work. 4) Develop an alternative cost of action to execute or expedite process or progress. 5) Present proposal to client and stakeholder on financial standing and team readiness. 6) Perform regular meeting with client, third parties, and project manager to report progress. 7) Build strong relationship with client.	**Project Director** 1) Develop a timeline for the completion for a certain milestone for a given project. 2) Monitor project progress, provide financial control and expenses as well as ensure project quality. 3) Recommend changes to project that is ongoing if it appears not proceeding according to schedule or scope of work. 4) Develop an alternative cost of action to execute or expedite process or progress. 5) Present proposal to client and stakeholder on financial standing and team readiness. 6) Perform regular meeting with client, third parties, and project manager to report progress. 7) Build strong relationship with client.	**Project Director** 1) Develop a timeline for the completion for a certain milestone for a given project. 2) Monitor project progress, provide financial control and expenses as well as ensure project quality. 3) Recommend changes to project that is ongoing if it appears not proceeding according to schedule or scope of work. 4) Develop an alternative cost of action to execute or expedite process or progress. 5) Present proposal to client and stakeholder on financial standing and team readiness. 6) Perform regular meeting with client, third parties, and project manager to report progress. 7) Build strong relationship with client.

AREA	Form Work (In Situ Work)	Rebar / Spacer (In Situ Work)	Concreting (In Situ Work)
	8) Make strategic decision and provide necessary leadership and direction for teams of project managers to implement those decisions.	8) Make strategic decision and provide necessary leadership and direction for teams of project managers to implement those decisions.	8) Make strategic decision and provide necessary leadership and direction for teams of project managers to implement those decisions.
LEVEL 7	**Project Manager** 1) Approve project cost to stay within project limits. 2) Approve developed scope of work and project function. 3) Verify overall project status report and present to project team management and client. 4) Update project progress or status to top management and client. 5) Verify project documentation such as diagram, masterplan, overall work program. 6) Approve design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement.	**Project Manager** 1) Approve project cost to stay within project limits. 2) Approve developed scope of work and project function. 3) Verify overall project status report and present to project team management and client. 4) Update project progress or status to top management and client. 5) Verify project documentation such as diagram, masterplan, overall work program. 6) Approve design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement.	**Project Manager** 1) Approve project cost to stay within project limits. 2) Approve developed scope of work and project function. 3) Verify overall project status report and present to project team management and client. 4) Update project progress or status to top management and client. 5) Verify project documentation such as diagram, masterplan, overall work program. 6) Approve design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement.

AREA	Form Work (In Situ Work)	Rebar / Spacer (In Situ Work)	Concreting (In Situ Work)
	7) Request for approval design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement (conventional). 8) Approve request for information (RFIn) to clarify uncertainties. 9) Verify works of sub-contractors to ensure quality and conformance to design specifications, budget allocation and client requirement. 10) Liaise and negotiate with consultant for project progress deadline and matters arising. 11) Initiate program or instruct construction site manager to conform with safety, health and environmental officer to ensure compliance with regulation. 12) Lead project team to meet project objectives and scopes of work within budget allocated. 13) Perform risk management activities to minimize project risk.	7) Request for approval design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement (conventional). 8) Approve request for information (RFIn) to clarify uncertainties. 9) Verify works of sub-contractors to ensure quality and conformance to design specifications, budget allocation and client requirement. 10) Liaise and negotiate with consultant for project progress deadline and matters arising. 11) Initiate program or instruct construction site manager to conform with safety, health and environmental officer to ensure compliance with regulation. 12) Lead project team to meet project objectives and scopes of work within budget allocated. 13) Perform risk management activities to minimize project risk.	7) Request for approval design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement (conventional). 8) Approve request for information (RFIn) to clarify uncertainties. 9) Verify works of sub-contractors to ensure quality and conformance to design specifications, budget allocation and client requirement. 10) Liaise and negotiate with consultant for project progress deadline and matters arising. 11) Initiate program or instruct construction site manager to conform with safety, health and environmental officer to ensure compliance with regulation. 12) Lead project team to meet project objectives and scopes of work within budget allocated. 13) Perform risk management activities to minimize project risk.

AREA	Form Work (In Situ Work)	Rebar / Spacer (In Situ Work)	Concreting (In Situ Work)
	14) Represent company in meetings.	14) Represent company in meetings.	14) Represent company in meetings.
LEVEL 6	**Construction Manager** 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 term 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 programme. 6) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.	**Construction Manager** 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 term 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 programme. 6) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.	**Construction Manager** 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 term 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 programme. 6) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.

AREA	Form Work (In Situ Work)	Rebar / Spacer (In Situ Work)	Concreting (In Situ Work)
	7) Inspect or review project deliverables to monitor compliance with requirement. 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 construction work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings.	7) Inspect or review project deliverables to monitor compliance with requirement. 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 construction work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings.	7) Inspect or review project deliverables to monitor compliance with requirement. 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 construction work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings.
LEVEL 5	**Engineer** 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates.	**Engineer** 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates.	**Engineer** 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates.

AREA	Form Work (In Situ Work)	Rebar / Spacer (In Situ Work)	Concreting (In Situ Work)
	3) Inspect or review project deliverables to monitor compliance with requirement. 4) Monitor work progress. 5) Plan and organize 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 master work programme/ project milestone. 9) Direct and supervise construction contractor, sub-contractor or related worker. 10) Identify and report any errors or discrepancies on construction drawing/shop drawing. 11) Propose technical solution to resolve discrepancies on construction drawing/shop drawing/value engineering.	3) Inspect or review project deliverables to monitor compliance with requirement. 4) Monitor work progress. 5) Plan and organize 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 master work programme/ project milestone. 9) Direct and supervise construction contractor, sub-contractor or related worker. 10) Identify and report any errors or discrepancies on construction drawing/shop drawing. 11) Propose technical solution to resolve discrepancies on construction drawing/shop drawing/value engineering.	3) Inspect or review project deliverables to monitor compliance with requirement. 4) Monitor work progress. 5) Plan and organize 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 master work programme/ project milestone. 9) Direct and supervise construction contractor, sub-contractor or related worker. 10) Identify and report any errors or discrepancies on construction drawing/shop drawing. 11) Propose technical solution to resolve discrepancies on construction drawing/shop drawing/value engineering.

AREA	Form Work (In Situ Work)	Rebar / Spacer (In Situ Work)	Concreting (In Situ Work)
	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 drawing.	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 drawing.	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 drawing.
LEVEL 4	**Coordinator** 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 drawing, specification and bill of quantity (BQ). 5) Coordinate and inspect shop drawing production. 6) Assist in identifying and reporting any errors or discrepancies on	**Coordinator** 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 drawing, specification and bill of quantity (BQ). 5) Coordinate and inspect shop drawing production. 6) Assist in identifying and reporting any errors or discrepancies on	**Coordinator** 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 drawing, specification and bill of quantity (BQ). 5) Coordinate and inspect shop drawing production. 6) Assist in identifying and reporting any errors or discrepancies on

AREA	Form Work (In Situ Work)	Rebar / Spacer (In Situ Work)	Concreting (In Situ Work)
	construction drawing/shop drawing. 7) Identify variation order. 8) Assist in preparing progress claim for construction work. 9) Attend technical and site meetings. 10) Identify and solve interfacing problem. 11) Assist in producing as-built drawing.	construction drawing/shop drawing. 7) Identify variation order. 8) Assist in preparing progress claim for construction work. 9) Attend technical and site meetings. 10) Identify and solve interfacing problem. 11) Assist in producing as-built drawing.	construction drawing/shop drawing. 7) Identify variation order. 8) Assist in preparing progress claim for construction work. 9) Attend technical and site meetings. 10) Identify and solve interfacing problem. 11) Assist in producing as-built drawing.
LEVEL 3	**Supervisor** 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.	**Supervisor** 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.	**Supervisor** 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.

AREA	Form Work (In Situ Work)	Rebar / Spacer (In Situ Work)	Concreting (In Situ Work)
	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 hazard and risk. 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 requirement.	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 hazard and risk. 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 requirement.	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 hazard and risk. 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 requirement.

AREA	Form Work (In Situ Work)	Rebar / Spacer (In Situ Work)	Concreting (In Situ Work)
	19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities including QA QC documents, SHE documents.	19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities including QA QC documents, SHE documents.	19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities including QA QC documents, SHE documents.
LEVEL 2	**Carpenter** 1) Perform work as per method statement; 2) Carry out timber work. 3) Measure, mark or record measurements. 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 standard operating procedure. 9) Update daily work report.	**Bar bender** 1) Request for reinforcement bar storage area. 2) Maintain and upkeep hand tools, reinforcement bar and bar bending machine. 3) Prepare bar bending work bench. 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.	**Concreter** 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 water proofing. 5) Assist in carrying out sample testing. 6) Assist in taking concrete sample for testing. 7) Carry out concrete mixing. 8) Handle tools and equipment. 9) Perform routine maintenance.

AREA	Form Work (In Situ Work)	Rebar / Spacer (In Situ Work)	Concreting (In Situ Work)
LEVEL 1	**General Worker** 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.	**General Worker** 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.	**General Worker** 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 4.19: List of Responsibilities for Group 410 Based on Table 4.12 (4 of 6)

AREA	Cutting / Welding (Steel Work)	Installation (Steel Work)
LEVEL 8	**Project Director** 1) Develop a timeline for the completion for a certain milestone for a given project. 2) Monitor project progress, provide financial control and expenses as well as ensure project quality. 3) Recommend changes to project that is ongoing if it appears not proceeding according to schedule or scope of work. 4) Develop an alternative cost of action to execute or expedite process or progress. 5) Present proposal to client and stakeholder on financial standing and team readiness. 6) Perform regular meeting with client, third parties, and project manager to report progress. 7) Build strong relationship with client. 8) Make strategic decision and provide necessary leadership and direction for teams of project managers to implement those decisions.	**Project Director** 1) Develop a timeline for the completion for a certain milestone for a given project. 2) Monitor project progress, provide financial control and expenses as well as ensure project quality. 3) Recommend changes to project that is ongoing if it appears not proceeding according to schedule or scope of work. 4) Develop an alternative cost of action to execute or expedite process or progress. 5) Present proposal to client and stakeholder on financial standing and team readiness. 6) Perform regular meeting with client, third parties, and project manager to report progress. 7) Build strong relationship with client. 8) Make strategic decision and provide necessary leadership and direction for teams of project managers to implement those decisions.
LEVEL 7	**Project Manager** 1) Approve project cost to stay within project limits. 2) Approve developed scope of work and project function.	**Project Manager** 1) Approve project cost to stay within project limits. 2) Approve developed scope of work and project function.

AREA	Cutting / Welding (Steel Work)	Installation (Steel Work)
	3) Verify overall project status report and present to project team management and client. 4) Update project progress or status to top management and client. 5) Verify project documentation such as diagram, masterplan, overall work program. 6) Approve design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement. 7) Request for approval design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement (conventional). 8) Approve request for information (RFIn) to clarify uncertainties 9) Verify works of sub-contractors to ensure quality and conformance to design specifications, budget allocation and client requirement. 10) Liaise and negotiate with consultant for project progress deadline and matters arising. 11) Initiate program or instruct construction site manager to conform with safety, health and environmental officer to ensure compliance with regulation. 12) Lead project team to meet project objectives and scopes of work within budget allocated.	3) Verify overall project status report and present to project team management and client. 4) Update project progress or status to top management and client. 5) Verify project documentation such as diagram, masterplan, overall work program. 6) Approve design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement. 7) Request for approval design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement (conventional). 8) Approve request for information (RFIn) to clarify uncertainties 9) Verify works of sub-contractors to ensure quality and conformance to design specifications, budget allocation and client requirement. 10) Liaise and negotiate with consultant for project progress deadline and matters arising. 11) Initiate program or instruct construction site manager to conform with safety, health and environmental officer to ensure compliance with regulation. 12) Lead project team to meet project objectives and scopes of work within budget allocated.

AREA	Cutting / Welding (Steel Work)	Installation (Steel Work)
	13) Perform risk management activities to minimize project risk. 14) Represent company in meetings.	13) Perform risk management activities to minimize project risk. 14) Represent company in meetings.
LEVEL 6	**Construction Manager** 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 term 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 programme. 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 requirement. 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.	**Construction Manager** 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 term 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 programme. 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 requirement. 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

AREA	Cutting / Welding (Steel Work)	Installation (Steel Work)
	10) Participate in construction management process for smooth progress of construction works. 11) Coordinate construction work according to Inspection Test Plan 12) Ensure SHE compliance. 13) Represent company in meetings.	10) Participate in construction management process for smooth progress of construction works. 11) Coordinate construction work according to Inspection Test Plan 12) Ensure SHE compliance. 13) Represent company in meetings.
LEVEL 5	**Engineer** 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. 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 master work program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor or related worker. 10) Identify and report any errors or discrepancies on construction drawing/shop drawing.	**Engineer** 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. 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 master work program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor or related worker. 10) Identify and report any errors or discrepancies on construction drawing/shop drawing.

AREA	Cutting / Welding (Steel Work)	Installation (Steel Work)
	11) Propose technical solution 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 drawing.	11) Propose technical solution 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 drawing.
LEVEL 4	**Coordinator** 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 drawing, specification and bill of quantity (BQ). 5) Coordinate and inspect shop drawing production. 6) Assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing. 7) Identify variation order. 8) Assist in preparing progress claim for construction work. 9) Attend technical and site meetings. 10) Identify and solve interfacing problem. 11) Assist in producing as-built drawing.	**Coordinator** 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 drawing, specification and bill of quantity (BQ). 5) Coordinate and inspect shop drawing production. 6) Assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing. 7) Identify variation order. 8) Assist in preparing progress claim for construction work. 9) Attend technical and site meetings. 10) Identify and solve interfacing problem. 11) Assist in producing as-built drawing.

AREA	Cutting / Welding (Steel Work)	Installation (Steel Work)
LEVEL 3	**Foreman** 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 hazard and risk. 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.	**Supervisor** 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 hazard and risk. 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.

AREA	Cutting / Welding (Steel Work)	Installation (Steel Work)
	18) Conduct training for construction methods, operation of machinery and equipment, site safety requirement. 19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities including QA QC documents, SHE documents.	18) Conduct training for construction methods, operation of machinery and equipment, site safety requirement. 19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities including QA QC documents, SHE documents.
LEVEL 2	**Welder** 1) Perform work as per construction drawing and method statement. 2) Request for material storage area. 3) Determine welding method and material. 4) Prepare and clean surfaces and special part 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.	**Installer** 1) Perform work as per construction drawing and method statement. 2) Request for material storage area. 3) Perform installation of steel structure. 4) Carry out welding works. 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.
LEVEL 1	**General Worker** 1) Prepare tools, equipment and machinery. 2) Prepare materials. 3) Assist site works according to instruction.	**General Worker** 1) Prepare tools, equipment and machinery. 2) Prepare materials. 3) Assist site works according to instruction.

AREA	Cutting / Welding (Steel Work)	Installation (Steel Work)
	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.	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 4.20: List of Responsibilities for Group 410 Based on Table 4.13 (5 of 6)

AREA	Cutting / Joining (Timber Work)	Installation (Timber Work)
LEVEL 8	**Project Director** 1) Develop a timeline for the completion for a certain milestone for a given project. 2) Monitor project progress, provide financial control and expenses as well as ensure project quality. 3) Recommend changes to project that is ongoing if it appears not proceeding according to schedule or scope of work. 4) Develop an alternative cost of action to execute or expedite process or progress. 5) Present proposal to client and stakeholder on financial standing and team readiness. 6) Perform regular meeting with client, third parties, and project manager to report progress. 7) Build strong relationship with client. 8) Make strategic decision and provide necessary leadership and direction for teams of project managers to implement those decisions.	**Project Director** 1) Develop a timeline for the completion for a certain milestone for a given project. 2) Monitor project progress, provide financial control and expenses as well as ensure project quality. 3) Recommend changes to project that is ongoing if it appears not proceeding according to schedule or scope of work. 4) Develop an alternative cost of action to execute or expedite process or progress. 5) Present proposal to client and stakeholder on financial standing and team readiness. 6) Perform regular meeting with client, third parties, and project manager to report progress. 7) Build strong relationship with client. 8) Make strategic decision and provide necessary leadership and direction for teams of project managers to implement those decisions.
LEVEL 7	**Project Manager** 1) Approve project cost to stay within project limits. 2) Approve developed scope of work and project function.	**Project Manager** 1) Approve project cost to stay within project limits. 2) Approve developed scope of work and project function.

AREA	Cutting / Joining (Timber Work)	Installation (Timber Work)
	3) Verify overall project status report and present to project team management and client. 4) Update project progress or status to top management and client. 5) Verify project documentation such as diagram, masterplan and overall work program. 6) Approve design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement. 7) Request for approval design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement (conventional). 8) Approve request for information (RFIn) to clarify uncertainties 9) Verify works of sub-contractors to ensure quality and conformance to design specifications, budget allocation and client requirement. 10) Liaise and negotiate with consultant for project progress deadline and matters arising. 11) Initiate program or instruct construction site manager to conform with safety, health and environmental officer to ensure compliance with regulation. 12) Lead project team to meet project objectives and scopes of work within budget allocated.	3) Verify overall project status report and present to project team management and client. 4) Update project progress or status to top management and client. 5) Verify project documentation such as diagram, masterplan and overall work program. 6) Approve design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement. 7) Request for approval design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement (conventional). 8) Approve request for information (RFIn) to clarify uncertainties. 9) Verify works of sub-contractors to ensure quality and conformance to design specifications, budget allocation and client requirement. 10) Liaise and negotiate with consultant for project progress deadline and matters arising. 11) Initiate program or instruct construction site manager to conform with safety, health and environmental officer to ensure compliance with regulation. 12) Lead project team to meet project objectives and scopes of work within budget allocated.

AREA	Cutting / Joining (Timber Work)	Installation (Timber Work)
	13) Perform risk management activities to minimize project risk 14) Represent company in meetings.	13) Perform risk management activities to minimize project risk 14) Represent company in meetings.
LEVEL 6	**Construction Manager** 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 term 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. 7) Inspect or review project deliverables to monitor compliance with requirement. 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.	**Construction Manager** 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 term 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. 7) Inspect or review project deliverables to monitor compliance with requirement. 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.

AREA	Cutting / Joining (Timber Work)	Installation (Timber Work)
	10) Participate in construction management process for smooth progress of construction works. 11) Coordinate construction work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings.	10) Participate in construction management process for smooth progress of construction works. 11) Coordinate construction work according to Inspection Test Plan. 12) Ensure SHE compliance 13) Represent company in meetings.
LEVEL 5	**Engineer** 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. 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 master work programme/ project milestone. 9) Direct and supervise construction contractor, sub-contractor or related worker. 10) Identify and report any errors or discrepancies on construction drawing/shop drawing.	**Engineer** 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. 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 master work programme/ project milestone. 9) Direct and supervise construction contractor, sub-contractor or related worker. 10) Identify and report any errors or discrepancies on construction drawing/shop drawing.

AREA	Cutting / Joining (Timber Work)	Installation (Timber Work)
	11) Propose technical solution 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 drawing.	11) Propose technical solution 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 drawing.
LEVEL 4	**Coordinator** 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 drawing, specification and bill of quantity (BQ). 5) Coordinate and inspect shop drawing production. 6) Assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing. 7) Identify variation order. 8) Assist in preparing progress claim for construction work. 9) Attend technical and site meetings. 10) Identify and solve interfacing problem. 11) Assist in producing as-built drawing.	**Coordinator** 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 drawing, specification and bill of quantity (BQ). 5) Coordinate and inspect shop drawing production. 6) Assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing. 7) Identify variation order. 8) Assist in preparing progress claim for construction work. 9) Attend technical and site meetings. 10) Identify and solve interfacing problem. 11) Assist in producing as-built drawing.

AREA	Cutting / Joining (Timber Work)	Installation (Timber Work)
LEVEL 3	**Supervisor** 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 hazard and risk. 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.	**Supervisor** 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 hazard and risk. 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.

AREA	Cutting / Joining (Timber Work)	Installation (Timber Work)
	18) Conduct training for construction methods, operation of machinery and equipment, site safety requirement. 19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities including QA QC documents, SHE documents.	18) Conduct training for construction methods, operation of machinery and equipment, site safety requirement. 19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities including QA QC documents, SHE documents.
LEVEL 2	**Joiner** 1) Perform work as per construction drawing and method statement. 2) Request for material storage area. 3) Carry out cutting work. 4) Carry out cutting of timber joineries. 5) Carry out hoisting work. 6) Carry out support work for timber structure. 7) Paint the joint part. 8) Adhere to safety and security procedure. 9) Follow Standard Operating Procedure.	**Installer** 1) Perform work as per construction drawing and method statement. 2) Request for material storage area. 3) Perform installation of timber structure. 4) Carry out fixing of timber joineries. 5) Carry out hoisting work. 6) Paint the joint part. 7) Carry out support work for timber structure. 8) Adhere to safety and security procedure. 9) Follow Standard Operating Procedure.
LEVEL 1	**Helper** 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.	**Helper** 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.

AREA	Cutting / Joining (Timber Work)	Installation (Timber Work)
	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.	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 4.21: List of Responsibilities for Group 410 Based on Table 4.14 (6 of 6)

AREA	IBS Reusable Formwork	IBS Blockwork	IBS Precast Concrete System
LEVEL 8	**<u>Project Director</u>** 1) Develop a timeline for the completion for a certain milestone for a given project. 2) Monitor project progress, provide financial control and expenses as well as ensure project quality. 3) Recommend changes to project that is ongoing if it appears not proceeding according to schedule or scope of work. 4) Develop an alternative cost of action to execute or expedite process or progress. 5) Present proposal to client and stakeholder on financial standing and team readiness. 6) Perform regular meeting with client, third parties, and project manager to report progress. 7) Build strong relationship with client.	**<u>Project Director</u>** 1) Develop a timeline for the completion for a certain milestone for a given project. 2) Monitor project progress, provide financial control and expenses as well as ensure project quality. 3) Recommend changes to project that is ongoing if it appears not proceeding according to schedule or scope of work. 4) Develop an alternative cost of action to execute or expedite process or progress. 5) Present proposal to client and stakeholder on financial standing and team readiness. 6) Perform regular meeting with client, third parties, and project manager to report progress. 7) Build strong relationship with client.	**<u>Project Director</u>** 1) Develop a timeline for the completion for a certain milestone for a given project. 2) Monitor project progress, provide financial control and expenses as well as ensure project quality. 3) Recommend changes to project that is ongoing if it appears not proceeding according to schedule or scope of work. 4) Develop an alternative cost of action to execute or expedite process or progress. 5) Present proposal to client and stakeholder on financial standing and team readiness. 6) Perform regular meeting with client, third parties, and project manager to report progress. 7) Build strong relationship with client.

AREA	IBS Reusable Formwork	IBS Blockwork	IBS Precast Concrete System
	8) Make strategic decision and provide necessary leadership and direction for teams of project managers to implement those decisions.	8) Make strategic decision and provide necessary leadership and direction for teams of project managers to implement those decisions.	8) Make strategic decision and provide necessary leadership and direction for teams of project managers to implement those decisions.
LEVEL 7	**Project Manager** 1) Approve project cost to stay within project limits. 2) Approve developed scope of work and project function. 3) Verify overall project status report and present to project team management and client. 4) Update project progress or status to top management and client. 5) Verify project documentation such as diagram, masterplan, overall work program. 6) Approve design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement.	**Project Manager** 1) Approve project cost to stay within project limits. 2) Approve developed scope of work and project function. 3) Verify overall project status report and present to project team management and client. 4) Update project progress or status to top management and client. 5) Verify project documentation such as diagram, masterplan, overall work program. 6) Approve design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement.	**Project Manager** 1) Approve project cost to stay within project limits. 2) Approve developed scope of work and project function. 3) Verify overall project status report and present to project team management and client. 4) Update project progress or status to top management and client. 5) Verify project documentation such as diagram, masterplan, overall work program. 6) Approve design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement.

AREA	IBS Reusable Formwork	IBS Blockwork	IBS Precast Concrete System
	7) Request for approval design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement (conventional). 8) Approve request for information (RFIn) to clarify uncertainties. 9) Verify works of sub-contractors to ensure quality and conformance to design specifications, budget allocation and client requirement. 10) Liaise and negotiate with consultant for project progress deadline and matters arising. 11) Initiate program or instruct construction site manager to conform with safety, health and environmental officer to ensure compliance with regulation. 12) Lead project team to meet project objectives and scopes of work within budget allocated. 13) Perform risk management activities to minimize project risk.	7) Request for approval design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement (conventional). 8) Approve request for information (RFIn) to clarify uncertainties. 9) Verify works of sub-contractors to ensure quality and conformance to design specifications, budget allocation and client requirement. 10) Liaise and negotiate with consultant for project progress deadline and matters arising. 11) Initiate program or instruct construction site manager to conform with safety, health and environmental officer to ensure compliance with regulation. 12) Lead project team to meet project objectives and scopes of work within budget allocated. 13) Perform risk management activities to minimize project risk.	7) Request for approval design, engineering or construction technical documentation to ensure compliance with regulation industrial code and standard, and client requirement (conventional). 8) Approve request for information (RFIn) to clarify uncertainties. 9) Verify works of sub-contractors to ensure quality and conformance to design specifications, budget allocation and client requirement. 10) Liaise and negotiate with consultant for project progress deadline and matters arising. 11) Initiate program or instruct construction site manager to conform with safety, health and environmental officer to ensure compliance with regulation. 12) Lead project team to meet project objectives and scopes of work within budget allocated. 13) Perform risk management activities to minimize project risk.

AREA	IBS Reusable Formwork	IBS Blockwork	IBS Precast Concrete System
	14) Represent company in meetings.	14) Represent company in meetings.	14) Represent company in meetings.
LEVEL 6	**<u>Construction Manager</u>** 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 term 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 programme. 6) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.	**<u>Construction Manager</u>** 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 term 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 programme. 6) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.	**<u>Construction Manager</u>** 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 term 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 programme. 6) Interpret method statement to determine and monitor execution of procedure/work sequence for the project.

AREA	IBS Reusable Formwork	IBS Blockwork	IBS Precast Concrete System
	7) Inspect or review project deliverables to monitor compliance with requirement. 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 construction work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings.	7) Inspect or review project deliverables to monitor compliance with requirement. 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 construction work according to Inspection Test Plan 12) Ensure SHE compliance. 13) Represent company in meetings.	7) Inspect or review project deliverables to monitor compliance with requirement. 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 construction work according to Inspection Test Plan. 12) Ensure SHE compliance. 13) Represent company in meetings.
LEVEL 5	**Engineer** 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates.	**Engineer** 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates.	**Engineer** 1) Plan, schedule, or coordinate site activities to meet deadlines. 2) Prepare project costing and request budget estimates.

AREA	IBS Reusable Formwork	IBS Blockwork	IBS Precast Concrete System
	3) Inspect or review project deliverables to monitor compliance with requirement. 4) Monitor work progress. 5) Plan and organize 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 master work program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor or related worker. 10) Identify and report any errors or discrepancies on construction drawing/shop drawing. 11) Propose technical solution to resolve discrepancies on construction drawing/shop drawing/value engineering.	3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organize 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 master work program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor or related worker. 10) Identify and report any errors or discrepancies on construction drawing/shop drawing. 11) Propose technical solution to resolve discrepancies on construction drawing/shop drawing/value engineering.	3) Inspect or review project deliverables to monitor compliance with requirement 4) Monitor work progress. 5) Plan and organize 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 master work program/ project milestone. 9) Direct and supervise construction contractor, sub-contractor or related worker. 10) Identify and report any errors or discrepancies on construction drawing/shop drawing. 11) Propose technical solution to resolve discrepancies on construction drawing/shop drawing/value engineering.

AREA	IBS Reusable Formwork	IBS Blockwork	IBS Precast Concrete System
	12) Develop or implement quality control and environmental protection program. 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 drawing.	12) Develop or implement quality control and environmental protection program. 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 drawing.	12) Develop or implement quality control and environmental protection program. 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 drawing.
LEVEL 4	**Coordinator** 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 drawing, specification and bill of quantity (BQ). 5) Coordinate and inspect shop drawing production. 6) Assist in identifying and reporting any errors or discrepancies on	**Coordinator** 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 drawing, specification and bill of quantity (BQ). 5) Coordinate and inspect shop drawing production. 6) Assist in identifying and reporting any errors or discrepancies on	**Coordinator** 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 drawing, specification and bill of quantity (BQ). 5) Coordinate and inspect shop drawing production. 6) Assist in identifying and reporting any errors or discrepancies on

AREA	IBS Reusable Formwork	IBS Blockwork	IBS Precast Concrete System
	construction drawing/shop drawing. 7) Identify variation order. 8) Assist in preparing progress claim for construction work. 9) Attend technical and site meetings. 10) Identify and solve interfacing problem. 11) Assist in producing as-built drawing.	construction drawing/shop drawing. 7) Identify variation order. 8) Assist in preparing progress claim for construction work. 9) Attend technical and site meetings. 10) Identify and solve interfacing problem. 11) Assist in producing as-built drawing.	construction drawing/shop drawing. 7) Identify variation order. 8) Assist in preparing progress claim for construction work. 9) Attend technical and site meetings. 10) Identify and solve interfacing problem. 11) Assist in producing as-built drawing.
LEVEL 3	**Supervisor** 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.	**Supervisor** 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.	**Supervisor** 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.

AREA	IBS Reusable Formwork	IBS Blockwork	IBS Precast Concrete System
	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 hazard and risk. 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 requirement.	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 hazard and risk. 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 requirement.	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 hazard and risk. 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 requirement.

AREA	IBS Reusable Formwork	IBS Blockwork	IBS Precast Concrete System
	19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities including QA QC documents, SHE documents.	19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities including QA QC documents, SHE documents.	19) Troubleshoot and rectify within work scope. 20) Prepare and compile reports for site activities including QA QC documents, SHE documents.
LEVEL 2	**Installer** 1) Perform work as per construction drawing and method statement. 2) Request for formwork material storage area. 3) Apply mould release oil. 4) Carry out hoisting work. 5) Perform installation of formwork. 6) Carry out support/bracing work for formwork. 7) Check verticality, horizontality and orientation of formwork. 8) Adhere to safety and security procedure. 9) Follow Standard Operating Procedure.	**Installer** 1) Carry-out blockworks activities including blockworks hand tools and materials. 2) Preparation, working area setting out, adhesive mixing, blockworks installation and other requirements to ensure effective and efficient blockworks activities. 3) Store blockworks materials. 4) Perform blockworks material storage. 5) Maintain and upkeep blockworks equipment. 6) Install damp proof material. 7) Perform wall base and block pier setting out. 8) Prepare blockworks adhesive.	**Installer** 1) Follow work instruction and job requirement. 2) Prepare precast component storage area in his/ her area of responsibility during site mobilization. 3) Install levelling pad, levelling bolt, precast wall panel, temporary propping, lay backer rod, pack cement mortar, install precast column, precast staircase, precast slab, precast gutter, precast bathroom to maximum productivity achievement within quality requirement. 4) Carry out joint grouting, wet joint casting, concrete slab topping and apply joint sealant during

AREA	IBS Reusable Formwork	IBS Blockwork	IBS Precast Concrete System
		9) Perform installation of blockworks such as straight wall, door and window. 10) Provide opening for mechanical and electrical services, perform housekeeping.	installation works to maximum productivity achievement within quality requirement. 5) Perform site quality control within his/ her area of responsibility such as perform starter bar defect rectification and carry out precast component crack repair works to comply with precast component quality standard. 6) Able to abide by safety rules and regulations.
LEVEL 1	**General Worker** 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.	**General Worker** 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.	**General Worker** 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.

AREA	IBS Reusable Formwork	IBS Blockwork	IBS Precast Concrete System
	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.	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.	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.

4.6 Mapping OS vs Available NOSS

This section provides a mapping of occupational structure with available NOSS. A total of 12 available NOSS are identified and mapping over with the occupational structure produce. There are some available NOSS that cannot be mapping with current occupational structure as listed in Table 4.22 because some older available NOSS are not included in these 2 digits MSIC 2008 Division 41: Construction of buildings as these NOSS are included in another division. While, the result of the mapping are listed in the Table 4.23 to Table 4.26.

Table 4.22: List of NOSS not included in Division 41

NO.	CORRESPONDING NOSS/LEVEL
1)	CVS3 (2002) Civil & Structural Supervisor
2)	CVS4 (2002) Civil & Structural Manager
3)	ARB3 (2002) Architectural & Building Supervisor
4)	ARB4 (2003) Architectural & Building Manager
5)	MCE3 (2002) Mechanical & Electrical Supervisor
6)	MCE4 (2003) Mechanical & Electrical Manager
7)	BC-010-3 / STS3 (2010) Structural Supervisor
8)	BC-020-3 /MSR3 (2010) Masonry Supervisor
9)	BRL1 (2008) Bricklayer
10)	BRL2 (2008) Bricklayer
11)	PLR1 (2008) Plasterer

12)	PLR2 (2008) Plasterer
13)	TLR1 (2008) Tiler
14)	TLR2 (2008) Tiler
15)	F410-006-2:2018 IBS Lightweight Roof Trusses Installation
16)	F410-006-3:2018 IBS Lightweight Roof Trusses Installation Supervision
17)	BC-360-1 / RTT1 (2008) Roof Truss Installer (Timber)
18)	BC-360-2 / RTT2 (2008) Roof Truss Installer (Timber)
19)	CSH3 (2000) Construction Site Safety and Health Supervisor
20)	F410-005-2:2018 IBS Lightweight Panel (Non-Structural) System Installation
21)	F410-005-3:2018 IBS Lightweight Panel (Non-Structural) System Installation Supervision

Table 4.23: Mapping OS vs Available NOSS (1 of 4)

SECTION	**(F) CONSTRUCTION**		
DIVISION	**(41) CONSTRUCTION OF BUILDINGS**		
GROUP	**(410) CONSTRUCTION OF BUILDINGS**		
AREA	**Form Work (Pile Cap)**	**Rebar / Spacer (Pile Cap)**	**Concreting (Pile Cap)**
LEVEL 8	Project Director	Project Director	Project Director
LEVEL 7	Project Manager	Project Manager	Project Manager
LEVEL 6	Construction Manager	Construction Manager	Construction Manager
LEVEL 5	Engineer	Engineer	Engineer
LEVEL 4	Coordinator	Coordinator	Coordinator
LEVEL 3	F410-001-3:2019 BC-010-2 / FWC2 (2010)	Supervisor	F410-001-3:2019
LEVEL 2	F410-001-2:2019 BC-010-1 / FWC1 (2010	BBR2 (2008)	F410-001-2:2019 BC-011-2 / CCT2 (2010)
LEVEL 1	General Worker	BBR1 (2008)	BC-011-1 / CCT1 (2010)

Table 4.24: Mapping OS vs Available NOSS (2 of 4)

SECTION	(F) CONSTRUCTION		
DIVISION	(41) CONSTRUCTION OF BUILDINGS		
GROUP	(410) CONSTRUCTION OF BUILDINGS		
AREA	FORM WORK (GROUND BEAM)	REBAR / SPACER (GROUND BEAM)	CONCRETING (GROUND BEAM)
Level 8	Project Director	Project Director	Project Director
Level 7	Project Manager	Project Manager	Project Manager
Level 6	Construction Manager	Construction Manager	Construction Manager
Level 5	Engineer	Engineer	Engineer
Level 4	Coordinator	Coordinator	Coordinator
Level 3	F410-001-3:2019 BC-010-2 / FWC2 (2010)	Supervisor	F410-001-3:2019
Level 2	F410-001-2:2019 BC-010-1 / FWC1 (2010)	BBR2 (2008)	BC-011-2 / CCT2 (2010)
Level 1	General Worker	BBR1 (2008)	BC-011-1 / CCT1 (2010)

Table 4.25: Mapping OS vs Available NOSS (3 of 4)

SECTION	(F) CONSTRUCTION		
DIVISION	(41) CONSTRUCTION OF BUILDINGS		
GROUP	(410) CONSTRUCTION OF BUILDINGS		
AREA	FORM WORK (IN SITU WORK)	REBAR / SPACER (IN SITU WORK)	CONCRETING (IN SITU WORK)
Level 8	Project Director	Project Director	Project Director
Level 7	Project Manager	Project Manager	Project Manager
Level 6	Construction Manager	Construction Manager	Construction Manager
Level 5	Engineer	Engineer	Engineer
Level 4	Coordinator	Coordinator	Coordinator
Level 3	F410-001-2:2019 BC-010-2 / FWC2 (2010)	Supervisor	F410-001-3:2019
Level 2	F410-001-2:2019 BC-010-1 / FWC1 (2010)	BBR2 (2008)	BC-011-2 / CCT2 (2010)
Level 1	General Worker	BBR1 (2008)	BC-011-1 / CCT1 (2010)

Table 4.26: Mapping OS vs Available NOSS (4 of 4)

SECTION	(F) CONSTRUCTION		
DIVISION	(41) CONSTRUCTION OF BUILDINGS		
GROUP	(410) CONSTRUCTION OF BUILDINGS		
AREA	IBS REUSABLE FORMWORK	IBS BLOCKWORK	IBS PRECAST CONCRETE SYSTEM
Level 8	Project Director	Project Director	Project Director
Level 7	Project Manager	Project Manager	Project Manager
Level 6	Construction Manager	Construction Manager	Construction Manager
Level 5	Engineer	Engineer	Engineer
Level 4	Coordinator	Coordinator	Coordinator
Level 3	F410-003-3:2017	F410-002-3:2017	F410-004-3:2017
Level 2	F410-003-2:2017	F410-002-2:2017	F410-004-2:2017
Level 1	General Worker	General Worker	General Worker

4.7 Occupational Description

Occupational Description is a broad, general, and written statement of a specific job based on the findings of a job analysis. It generally includes duties, purpose, responsibilities, scope, and working conditions of a job along with the job title, and the name or designation of the person to whom the employee reports. There are 48 Occupational Description provided in Annex 6 which are the job titles that have been identified as critical or hard-to-fill job as suggested by industry representatives from the focus group discussion.

4.8 Conclusion

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

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

CHAPTER 5: DISCUSSION, RECOMMENDATIONS AND CONCLUSION

5.1 Discussion

Based on the findings obtained throughout the Occupational Analysis on the construction of buildings industry, 16 job areas have been identified and confirmed to be in tandem with MSIC 2008. 128 job titles are listed of which 48 of them are classified as critical job titles and 18 job titles are identified as job titles related to IR4.0. The job titles identified require a holistic approach in development of 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 a more structured skills training. This will also enable personnel who are experienced and skilled to be certified through the Recognition of Prior Achievement. The list of NOSS which are already developed under 2 digits MSIC 2008 Division 41: Construction of buildings is presented in Table 2.6. This study provides a relatively comprehensive 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

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

From the focus group discussion, the panel listed several problems regarding the construction industry. Among the main problems are the lack of young local workers and high dependency on foreign workers. Thus, the suggestion given by the panel are

a) Increase the levy for foreign workers

b) Provide incentive to contractors for using local workers.
c) Ensure contractors to hire the local workers as full-time workers.

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

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

a) To continue and streamline efforts in NOSS development for areas under the industry in line with the findings of this analysis. This includes the development of the NOSS areas that are in demand and have not been developed.
b) To encourage apprenticeship training (National Dual Training System –NDTS) for the related job areas.
c) Promote certification of existing and experienced personnel in the sector through Recognition of Prior Achievement (RPA) (*Pentauliahan Pencapaian Terdahulu* – PPT).

5.3 Conclusion

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

Objective 1: To establish the OS for MSIC 2008, Section F Division 41: Construction of Buildings

As a result of the occupational analysis conducted together with expert panel members from various organisations, a total of 16 areas and 128 job titles have been identified.

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

Objective 2: To list the critical jobs in the construction of building industry

The Focus Group Discussion members have identified 48 critical job titles in the construction of buildings industry as listed in ANNEX 4. 1 critical job title is also listed in COL 2018/2019.

Objective 3: To establish the OD for each job title based on the latest industry OS

The Occupational Descriptions for all the different job titles were obtained from Focus Group Discussion and related reports. These Occupational Descriptions will also serve as reference of job scope and the required competencies for NOSS development.

Objective 4: To examine the competencies in demand in the construction of building industry

Based on the Focus Group Discussion and survey findings, the competencies in demand according to category of workers are as follows:

a) Low skilled workers
   i) Construction method knowledge;
   ii) General attitude towards work;
   iii) Product knowledge; and
   iv) Technical skills.

b) Semi-skilled workers
   i) Construction method knowledge;
   ii) Planning and forecasting ability;

iii) Technical skills;
iv) Communication skills;
v) Leadership; and
vi) Quality assurance and quality control knowledge.

c) Skilled workers
i) Computer literacy;
ii) Communication skills;
iii) Diagnostic skills;
iv) Strong technical prediction;
v) Leadership; and
vi) Administration skills.

Objective 5: To identify job titles relevant to Industry Revolution 4.0 in the construction of building industry

During the focus group discussion, expert panels from the industry have listed and identified 18 job titles that are related to IR4.0. The job titles that are related to IR4.0 are listed in ANNEX 5.

The results of this Occupational Framework research and development work can be used as key reference as how to fulfil the future plans of developing skilled personnel and certifying Malaysians in the construction industry towards enhancing services provided by the sector players.

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ANNEX 1: MOSQF LEVEL DESCRIPTORS

Malaysian Occupational Skills Qualification Framework (MOSQF) Level Descriptor

(Source: Department of Skill 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.
4	Achievement at this level reflects the ability to identify and use relevant understanding, methods and skills to address problems that are well defined but complex and non-routine. It includes taking responsibility for overall courses of action as well as exercising autonomy and judgment within fairly broad parameters. It also reflects under-standing of different perspective or approaches within a sub-area of study or work.
3	Achievement at this level reflects the ability to identify and use relevant understanding, methods and skills to complete task and address problems that are well defined with a measure of complexity. It includes taking responsibility for initiating and completing tasks and procedures as well as exercising autonomy and judgments within limited parameter. It also reflects awareness of different perspectives or approaches within a sub-area of study or work.
2	Achievement at this level reflects the ability to select and use relevant knowledge, ideas, skills and procedures to complete well-defined tasks and address straightforward problem. It includes taking responsibility for completing tasks and procedures, and exercising autonomy and judgment subject to overall direction or guidance.
1	Achievement at this level reflects the ability to use relevant knowledge, skills and procedures to complete routine and predictable tasks that include responsibility for completing tasks and procedures subject to direction or guidance.

ANNEX 2: LIST OF CONTRIBUTORS

LIST OF SECTOR PANEL MEMBERS FOR CONSTRUCTION OF BUILDINGS FRAMEWORK DEVELOPMENT

NO.	NAME	ORGANISATION
1.	Ir. Redzuan Bin Ab. Rahman	Ekovest MRCB Construction Sdn. Bhd.
2.	Mohamad Yusrey Bin Mahat	Lembaga Jurutera Malaysia
3.	Mohd Syarafi Bin Rohseli	Ceteau Malaysia Sdn. Bhd.
4.	Awi Bin Shahadan	Binaan Desjaya Sdn. Bhd.
5.	Ridzuan Zainal Abidin	Aecom Perunding Sdn. Bhd.
6.	Saadon Badri Bin Junoh	Jabatan Kerja Raya
7.	Hambali Bin Hussein	NHB Perunding (M) Sdn. Bhd.
8.	Nur Hurriyatul Huda Binti Abdullah Sani	Department of Statistics Malaysia
9.	YM Tengku Noradilah Binti Tengku Jalal	Department of Statistics Malaysia
10.	Akmalia Binti Hanifah	Department of Statistics Malaysia

LIST OF OCCUPATIONAL FRAMEWORK TECHNICAL EVALUATION COMMITTEE

NO.	NAME	ORGANISATION
1.	Mohd Dhiya Hafreez bin Kamil	Dasacon Sdn. Bhd.
2.	Razali bin Ahmad Zaman	Proven Construction and Development Sdn. Bhd.
3.	Rabi'atul'adawiah binti Shabli	Department of Statistics Malaysia

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

NO.	NAME	POSITION	ORGANISATION
1.	Siti Fauziah binti Jumadi	Principal Assistant Director	NOSS Division
2.	Jefrizan bin Abdul Rasid	Senior Assistant Director	NOSS Division
3.	Noor Azura binti Adnan	Senior Assistant Director	NOSS Division
4.	Azizah binti md Saleh	Senior Assistant Director	Planning, Research and Development Division
5.	Syazwani binti Azmi	Assistant Director	NOSS Division
6.	Nazrul Hilmi bin Mohammad	Assistant Director	NOSS Division
7.	Zainal bin Abdul Jalil	Senior Skills Development Officer	NOSS Division

LIST OF WORKFORCE TEAM IN OCCUPATIONAL FRAMEWORK DEVELOPMENT

NO.	NAME	ORGANISATION	POSITION
1.	Basharudin bin Mohamed	Edusure Sdn Bhd	Project Director
2.	Izzudin Fahmi bin Basharudin	Edusure Sdn Bhd	Project Manager
3.	Cristnorish bin Lianu	Edusure Sdn Bhd	Curriculum Development Executive I
4.	Ahmad Ramdan bin M Yusof	Edusure Sdn Bhd	Curriculum Development Executive II
5.	Nabilah Ooi binti Abdullah	Edusure Sdn Bhd	Facilitator

6.	Khairul Alia binti Mohd Kharudin	Edusure Sdn Bhd	Proofreader team
7.	Dr. Raemah binti Abdullah Hashim	Edusure Sdn Bhd	Researcher team
8.	Dr. Azahari bin Jamaludin	Edusure Sdn Bhd	Researcher team
9.	Nik Muslihuddin bin Nik Sulaiman	Edusure Sdn Bhd	Researcher team

ANNEX 3: QUESTIONNAIRE

Construction of Buildings Occupational Framework Survey

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

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

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

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

Nik Muslihuddin Bin Nik Sulaiman: nikmus94@gmail.com

Survey Respondent Details

Name :

Position :

Organisation :

Date :

Please answer the questions below in the space provided, additional pages may be added if necessary. There are 4 SECTIONS in this _ PAGES survey.

SECTION 1: COMPETENCIES IN DEMAND

1.1 Listed below are set of skills related to personnel involve in **Construction of Buildings**. Rate the level of demand to the set of skills by using the scale below:

No	Competencies	Low In Demand	Mid Demand	High In Demand
1	Technical skills			
2	Communication skills			
3	Diagnostic skills			
4	Troubleshooting / problem solving skills			
5	Administration skills			
6	Leadership			
7	Analytical skills			
8	Planning and Forecasting abilities			
9	General attitude towards work (commitment, resourcefulness, teamwork, etc.)			
10	Product knowledge			
11	Construction method knowledge			
12	Quality assurance and quality control knowledge			
13	Strong technical aptitude / manual dexterity			
14	Computer literacy			
15	Knowledge of other tools and devices			

SECTION 2: JOBS IN DEMAND

2.1 Listed below are job areas and description of category of skills. Based on your observation, which job area is experiencing **shortage and demand of manpower in Construction of Buildings Industry**?

Tick (√) where applicable.

Category of Skills	**Description**
Skilled Workers	Managers, Executive, Specialist, and Professional
Semi-Skilled Workers	Support, Technician, Admin and Machine Operator
Low Skilled Workers	Elementary Worker

No.	**Job Areas & Category of Skills**	**High Demand**	**Mid Demand**	**Low Demand**
1	**PILE CAP / FOOTING**			
	a) Skilled Workers			
	b) Semi-Skilled Workers			
	c) Low Skilled Workers			
2	**STUMP / GROUND BEAM**			
	a) Skilled Workers			
	b) Semi-Skilled Workers			
	c) Low Skilled Workers			
3	**IN SITU WORK**			
	a) Skilled Workers			
	b) Semi-Skilled Workers			
	c) Low Skilled Workers			
4	**STEEL WORK**			
	a) Skilled Workers			

	b) Semi-Skilled Workers			
	c) Low Skilled Workers			
5	**TIMBER WORK**			
	a) Skilled Workers			
	b) Semi-Skilled Workers			
	c) Low Skilled Workers			
INDUSTRIALISED BUILDING SYSTEM				
6	**REUSEABLE FORMWORK**			
	a) Skilled Workers			
	b) Semi-Skilled Workers			
	c) Low Skilled Workers			
7	**BLOCKWORK**			
	a) Skilled Workers			
	b) Semi-Skilled Workers			
	c) Low Skilled Workers			
8	**PRECAST CONCRETE SYSTEM**			
	a) Skilled Workers			
	b) Semi-Skilled Workers			
	c) Low Skilled Workers			

SECTION 3: EMERGING SKILLS

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

3.1 Do you think Industry Revolution 4.0 (Digitalization) (IR4.0) would give an impact to the economic activities of Construction of Buildings?

[__] Yes

[__] No

[__] Not sure

3.2 Listed below are the nine (9) technology drives/pillars of IR4.0. Which job area is likely to be affected by these 9 technology drives/pillars of IR4.0?

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

No.	TECHNOLOGY DRIVES / PILLARS	Conventional	Industrialised Building System
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)		
10	**Horizontal and Vertical Integration** (Horizontal: Integrate through network & value chain from Suppliers, the company itself, and the customers. Vertical: Integrate through network & value chain across functional department i.e., Sales, R&D, Procurement until customer services)		
11	**New Business Models** Business model is a combination of two functions: the process of value creation and the process of value capture. The process of value creation refers to the process of creating value for the target consumer. The process of value capture refers to converting market opportunities into performance outcomes for the firm, which then justifies value creation		

SECTION 4: RELATED ISSUES

4.1 What is/are the key issue/s related to Construction of buildings Industry?

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

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

No	KEY ISSUES	CONSTRUCTION OF BUILDINGS
1	Insufficient manpower	
2	Low skilled and low performance workforce	
3	High dependency on foreign labour	
4	Underpayment of wages lead to high turn over	
5	Product quality inconsistency	
6	Inconsistency in materials supply and price	
7	Economic conditions	
8	Government policy/regulation	
9	Labour costs	
10	Technological change	
11	Youth Involvement	
12	Lack of infrastructure support	
13	Poor facilities and amenities for worker	
14	Material shortage	
15	Machinery and equipment shortage	
16	Poor project planning	

End of Questionnaire

ANNEX 4: LIST OF CRITICAL JOB TITLES

Table 5.1: List of Critical Job Titles

NO	CRITICAL JOB TITLE	GROUP	AREA	LEVEL	SKILL LEVEL
	Conventional				
1)	CARPENTER	410	FORMWORK (PILE CAP)	2	SS
2)	SUPERVISOR	410	FORMWORK (PILE CAP)	3	SS
3)	COORDINATOR	410	FORMWORK (PILE CAP)	4	S
4)	BARBENDER	410	REBAR/SPACER (PILE CAP)	2	SS
5)	SUPERVISOR	410	REBAR/SPACER (PILE CAP)	3	SS
6)	COORDINATOR	410	REBAR/SPACER (PILE CAP)	4	S
7)	CONCRETOR	410	CONCRETING (PILE CAP)	2	SS
8)	SUPERVISOR	410	CONCRETING (PILE CAP)	3	SS
9)	COORDINATOR	410	CONCRETING (PILE CAP)	4	S
10)	CARPENTER	410	FORMWORK (GROUND BEAM)	2	SS
11)	SUPERVISOR	410	FORMWORK (GROUND BEAM)	3	SS
12)	COORDINATOR	410	FORMWORK (GROUND BEAM)	4	S
13)	BARBENDER	410	REBAR/SPACER (GROUND BEAM)	2	SS
14)	SUPERVISOR	410	REBAR/SPACER (GROUND BEAM)	3	SS
15)	COORDINATOR	410	REBAR/SPACER (GROUND BEAM)	4	S
16)	CONCRETOR	410	CONCRETING (GROUND BEAM)	2	SS
17)	SUPERVISOR	410	CONCRETING (GROUND BEAM)	3	SS
18)	COORDINATOR	410	CONCRETING (GROUND BEAM)	4	S
19)	CARPENTER	410	FORMWORK (IN SITU WORK)	2	SS
20)	SUPERVISOR	410	FORMWORK (IN SITU WORK)	3	SS
21)	COORDINATOR	410	FORMWORK (IN SITU WORK)	4	S

22)	BARBENDER	410	REBAR/SPACER (IN SITU WORK)	2	SS
23)	SUPERVISOR	410	REBAR/SPACER (IN SITU WORK)	3	SS
24)	COORDINATOR	410	REBAR/SPACER (IN SITU WORK)	4	S
25)	CONCRETOR	410	CONCRETING (IN SITU WORK)	2	SS
26)	SUPERVISOR	410	CONCRETING (IN SITU WORK)	3	SS
27)	COORDINATOR	410	CONCRETING (IN SITU WORK)	4	S
28)	WELDER*	410	CUTTING/WELDING (STEEL WORK)	2	SS
29)	FOREMAN	410	CUTTING/WELDING (STEEL WORK)	3	SS
30)	COORDINATOR	410	CUTTING/WELDING (STEEL WORK)	4	S
31)	INSTALLER	410	INSTALLATION (STEEL WORK)	2	SS
32)	SUPERVISOR	410	INSTALLATION (STEEL WORK)	3	SS
33)	COORDINATOR	410	INSTALLATION (STEEL WORK)	4	S
34)	JOINER	410	CUTTING/JOINING (TIMBER WORK)	2	SS
35)	SUPERVISOR	410	CUTTING/JOINING (TIMBER WORK)	3	SS
36)	COORDINATOR	410	CUTTING/JOINING (TIMBER WORK)	4	S
37)	INSTALLER	410	INSTALLATION (TIMBER WORK)	2	SS
38)	SUPERVISOR	410	INSTALLATION (TIMBER WORK)	3	SS
39)	COORDINATOR	410	INSTALLATION (TIMBER WORK)	4	S
	INDUSTRIALISED BUILDINGS SYSTEM				
40)	INSTALLER	410	IBS REUSABLE FORMWORK	2	SS
41)	SUPERVISOR	410	IBS REUSABLE FORMWORK	3	SS
42)	COORDINATOR	410	IBS REUSABLE FORMWORK	4	S
43)	INSTALLER	410	IBS BLOCKWORK	2	SS
44)	SUPERVISOR	410	IBS BLOCKWORK	3	SS
45)	COORDINATOR	410	IBS BLOCKWORK	4	S

46)	INSTALLER	410	IBS PRECAST CONCRETE	2	SS
47)	SUPERVISOR	410	IBS PRECAST CONCRETE	3	SS
48)	COORDINATOR	410	IBS PRECAST CONCRETE	4	S

*** Job Title listed in COL 2018/2019**

ANNEX 5: JOB TITLES RELEVANT TO IR4.0

List of Job Titles Relevant to IR4.0

NO	CRITICAL JOB TITLE	AREA	LEVEL	SKILL LEVEL
	INDUSTRIALISED BUILDINGS SYSTEM			
1)	SUPERVISOR	IBS REUSABLE FORMWORK	3	SS
2)	COORDINATOR	IBS REUSABLE FORMWORK	4	S
3)	ENGINEER	IBS REUSABLE FORMWORK	5	S
4)	CONSTRUCTION MANAGER	IBS REUSABLE FORMWORK	6	S
5)	PROJECT MANAGER	IBS REUSABLE FORMWORK	7	S
6)	PROJECT DIRECTOR	IBS REUSABLE FORMWORK	8	S
7)	SUPERVISOR	IBS BLOCKWORK	3	SS
8)	COORDINATOR	IBS BLOCKWORK	4	S
9)	ENGINEER	IBS BLOCKWORK	5	S
10)	CONSTRUCTION MANAGER	IBS BLOCKWORK	6	S
11)	PROJECT MANAGER	IBS BLOCKWORK	7	S
12)	PROJECT DIRECTOR	IBS BLOCKWORK	8	S
13)	SUPERVISOR	IBS PRECAST CONCRETE	3	SS
14)	COORDINATOR	IBS PRECAST CONCRETE	4	S
15)	ENGINEER	IBS PRECAST CONCRETE	5	S
16)	CONSTRUCTION MANAGER	IBS PRECAST CONCRETE	6	S
17)	PROJECT MANAGER	IBS PRECAST CONCRETE	7	S
18)	PROJECT DIRECTOR	IBS PRECAST CONCRETE	8	S

ANNEX 6: OCCUPATIONAL DESCRIPTION (OD)

SECTION : (F) CONSTRUCTION
DIVISION : (41) CONSTRUCTION OF BUILDINGS
GROUP : (410) CONSTRUCTION OF BUILDINGS

MSIC GROUP : 410
AREA : Formwork (Pile cap)
JOB TITLE : Carpenter
LEVEL : 2

RESPONSIBILITIES:
A formwork (pile cap) carpenter is responsible to perform tasks according to approved method statement, carry out timber work, measure, mark and record measurements, carry out preparation for testing, assembly and installation as per approved construction drawing, perform routine maintenance, adhere to safety and security procedure, follow standard operating procedure and prepare daily work report.

Knowledge:
- Basic mathematics
- Material knowledge (types of timber)
- Basic Safety Health Environment requirements
- Jointing techniques
- Construction drawing
- Tools usage

Skills:
- Apply carpentry skills
- Apply jointing techniques
- Interpret construction drawing

Attributes (Attitude/Safety/Environmental):
- Be physically fit
- Proactive in maintaining clean and safe work area
- Good communication skills
- Can work independently
- Very passionate with job

MSIC GROUP : 410
AREA : Formwork (Pile cap)
JOB TITLE : Supervisor
LEVEL : 3

RESPONSIBILITIES:

A formwork (pile cap) supervisor is responsible to assist in planning physical work activities in the respective trade, prepare daily work schedule, assign work based on job tasks, brief workers on work procedures, read and interpret construction drawings 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 materials, manpower and machinery, attend technical and site meetings, compile site documents or records to prepare reports, raise site safety concerns and identify construction hazards and risks, report site matters to superior or management, supervise subordinates' work, supervise compliance of safety, health and environment requirements, arrange for maintenance activities, perform subordinates' appraisal, conduct training for construction methods, operation of machinery and equipment, site safety requirement, troubleshoot and rectify within work scope and prepare and compile reports for site activities including QA QC documents and SHE documents.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Relevant timber specifications
- Jointing techniques
- QA and QC knowledge
- Project specifications
- Report writing
- Work supervision and appraisal

Skills:

- Apply carpentry skills
- Apply jointing techniques
- Interpret construction drawing
- Supervise subordinates' work performance

Attributes (Attitude/Safety/Environmental):

- High level of commitment and strong team player
- Result oriented mind-set

MSIC GROUP : 410
AREA : Formwork (Pile cap)
JOB TITLE : Coordinator
LEVEL : 4

RESPONSIBILITIES:
A formwork (pile cap) coordinator is responsible to plan physical work activities, compile and analyse submissions by site supervisor, submit technical and progress reports and issues to superior, understand and interpret approved construction drawing, specification and bill of quantity (BQ), coordinate and inspect shop drawing production, assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing, identify variation order, assist in preparing progress claim for construction work, attend technical and site meetings, identify and solve interfacing problems and assist in producing as-built drawing.

Knowledge:
- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Relevant timber specifications
- Jointing techniques
- QA and QC knowledge
- Project specifications
- Report writing
- Work supervision and productivity appraisal
- Knowledge in other trades (timber, steel, concrete, mechanical & electrical) requirements

Skills:
- Apply carpentry skills
- Apply jointing techniques
- Interpret construction drawing
- Plan and forecast construction activities

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 : 410
AREA : Rebar/spacer (Pile cap)
JOB TITLE : Bar bender
LEVEL : 2

RESPONSIBILITIES:

A rebar (pile cap) 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 : 410
AREA : Rebar/spacer (Pile cap)
JOB TITLE : Supervisor
LEVEL : 3

RESPONSIBILITIES:

A rebar (pile cap) supervisor is responsible to assist in planning physical work activities in the respective trade, prepare daily work schedule, assign work based on job tasks, brief workers on work procedures, read and interpret construction drawings 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 and prepare and compile reports for site activities including QA QC documents and SHE documents.

Knowledge:

- Work planning and scheduling
- Basic computer knowledge
- Safety Health Environment requirements
- Construction drawing
- Tools usage
- Material knowledge (types of rebar, BRC etc)
- Cutting, bending & assembling techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal

Skills:

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

Attributes (Attitude/Safety/Environmental):

- Ability to Supervise subordinates' work
- High level of commitment and strong team player
- Result oriented mind-set

MSIC GROUP : 410
AREA : Rebar/spacer (Pile cap)
JOB TITLE : Coordinator
LEVEL : 4

RESPONSIBILITIES:
A rebar (pile cap) coordinator is responsible to plan physical work activities, compile and analyse submissions by site supervisor, submit technical and progress reports and issues to superior, understand and interpret approved construction drawing, specification and bill of quantity (BQ), coordinate and inspect shop drawing production, assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing, identify variation order, assist in preparing progress claim for construction work, attend technical and site meetings, identify and solve interfacing problems and assist in producing as-built drawing.

Knowledge:
- Work planning and scheduling
- Basic computer knowledge
- Safety Health Environment requirements
- Construction drawing
- Tools usage
- Material knowledge (types of rebar, BRC etc)
- Cutting, bending & assembling techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and productivity appraisal
- Knowledge on other trade (timber, steel, concrete, mechanical & electrical) requirement

Skills:
- Apply bending skills
- Apply assembling techniques
- Interpret construction drawing
- Plan and forecast construction activities

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 : 410
AREA : Concreting (Pile cap)
JOB TITLE : Concreter
LEVEL : 2

RESPONSIBILITIES:

A pile cap concreter is responsible to 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 and perform routine maintenance.

Knowledge:

- Basic mathematics
- Material knowledge (grade and type of concrete)
- Concrete raw materials
- Basic Safety Health Environment requirements
- Mixing techniques
- Concrete mix ratio
- Compaction method
- Curing method
- Mould release agent
- Construction drawing
- Tools usage

Skills:

- Apply mixing 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 : 410
AREA : Concreting (Pile cap)
JOB TITLE : Supervisor
LEVEL : 3

RESPONSIBILITIES:

A concreting (pile cap) supervisor is responsible to assist in planning physical work activities in the respective trade, prepare daily work schedule, assign work based on job tasks, brief workers on work procedures, read and interpret construction drawings 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 and prepare and compile reports for site activities including QA QC documents and SHE documents.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Material knowledge (grade and type of concrete)
- Tools usage
- Mixing techniques
- Concrete mix ratio
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal

Skills:

- Apply mixing techniques
- Interpret construction drawing
- Supervise subordinates' work performance

Attributes (Attitude/Safety/Environmental):

- High level of commitment and strong team player
- Result oriented mind-set

MSIC GROUP : 410
AREA : Concreting (Pile cap)
JOB TITLE : Coordinator
LEVEL : 4

RESPONSIBILITIES:
A concreting (pile cap) coordinator is responsible to plan physical work activities, compile and analyse submissions by site supervisor, submit technical and progress reports and issues to superior, understand and interpret approved construction drawing, specification and bill of quantity (BQ), coordinate and inspect shop drawing production, assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing, identify variation order, assist in preparing progress claim for construction work, attend technical and site meetings, identify and solve interfacing problems and assist in producing as-built drawing.

Knowledge:
- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Material knowledge (grade and type of concrete)
- Mixing techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal
- Productivity
- Knowledge on other trade (timber, steel, concrete, mechanical & electrical) requirement

Skills:
- Apply mixing techniques
- Interpret construction drawing
- Plan and forecast construction activities

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 : 410
AREA : Formwork (Ground Beam)
JOB TITLE : Carpenter
LEVEL : 2

RESPONSIBILITIES:
A formwork (ground beam) carpenter is responsible to perform tasks according to approved method statement, carry out timber work, measure, mark and record measurements, carry out preparation for testing, assembly and installation as per approved construction drawing, perform routine maintenance, adhere to safety and security procedures, follow standard operating procedures and prepare daily work report.

Knowledge:
- Basic mathematics
- Material knowledge (types of timber)
- Basic Safety Health Environment requirements
- Jointing techniques
- Construction drawing
- Tools usage

Skills:
- Apply carpentry skills
- Apply jointing 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 : 410
AREA : Formwork (Ground Beam)
JOB TITLE : Supervisor
LEVEL : 3

RESPONSIBILITIES:

A formwork (ground beam) supervisor is responsible to assist in planning physical work activities in the respective trade, prepare daily work schedule, assign work based on job tasks, brief workers on work procedures, read and interpret construction drawings 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 and prepare and compile reports for site activities including QA QC documents and SHE documents.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- construction drawing
- Tools usage
- Relevant timber specification
- Jointing techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal

Skills:

- Apply carpentry skills
- Apply jointing techniques
- Interpret construction drawing
- Supervise subordinates' work performance

Attributes (Attitude/Safety/Environmental):

- High level of commitment and strong team player
- Result oriented mind-set

MSIC GROUP : 410
AREA : Formwork (Ground Beam)
JOB TITLE : Coordinator
LEVEL : 4

RESPONSIBILITIES:

A formwork (ground beam) coordinator is responsible to compile and analyse as per submission by site supervisor, submit technical and progress reports and issues to superior, understand and interpret on approved construction drawing (modular) specification, identify variation order, assist in identifying any errors and discrepancies on construction drawing, prepare progress claim for construction work, variation order on site and coordinate and inspect shop drawing production and competencies.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Relevant timber specification
- Jointing techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and productivity appraisal
- Knowledge on other trade (timber, steel, concrete, mechanical & electrical) requirement

Skills:

- Apply carpentry skills
- Apply jointing techniques
- Interpret construction drawing
- Plan and forecast construction activities

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 : 410
AREA : Rebar/spacer (Ground Beam)
JOB TITLE : Bar bender
LEVEL : 2

RESPONSIBILITIES:

A rebar (ground beam) 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 : 410
AREA : Rebar/spacer (Ground Beam)
JOB TITLE : Supervisor
LEVEL : 3

RESPONSIBILITIES:

A rebar (ground beam) supervisor is responsible to 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 drawings 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 and prepare and compile reports for site activities including QA QC documents and SHE documents.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Material knowledge (types of rebar, BRC etc)
- Cutting, bending & assembling techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal

Skills:

- Apply bending skills
- Apply assembling techniques
- Interpret construction drawing
- Supervise subordinates' work performance

Attributes (Attitude/Safety/Environmental):

- High level of commitment and strong team player
- Result oriented mind-set

MSIC GROUP : 410
AREA : Rebar/spacer (Ground Beam)
JOB TITLE : Coordinator
LEVEL : 4

RESPONSIBILITIES:
A rebar (ground beam) coordinator is responsible to plan physical work activities, compile and analyse submissions by site supervisor, submit technical and progress reports and issue to superior, understand and interpret approved construction drawing, specification and bill of quantity (BQ), coordinate and inspect shop drawing production, assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing, identify variation order, assist in preparing progress claim for construction work, attend technical and site meetings, identify and solve interfacing problems and assist in producing as-built drawing.

Knowledge:
- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Material knowledge (types of rebar, BRC etc)
- Cutting, bending & assembling techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and productivity appraisal
- Knowledge on other trade (timber, steel, concrete, mechanical & electrical) requirement

Skills:
- Apply bending skills
- Apply assembling techniques
- Interpret construction drawing
- Plan and forecast construction activities

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 : 410
AREA : Concreting (Ground Beam)
JOB TITLE : Concreter
LEVEL : 2

RESPONSIBILITIES:
A ground beam concreter is responsible to 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 and perform routine maintenance.

Knowledge:
- Basic mathematics
- Material knowledge (grade and type of concrete)
- Concrete raw materials
- Basic Safety Health Environment requirements
- Mixing techniques
- Concrete mix ratio
- Compaction method
- Curing method
- Mould release agent
- Construction drawing
- Tools usage

Skills:
- Apply mixing 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 : 410
AREA : Concreting (Ground Beam)
JOB TITLE : Supervisor
LEVEL : 3

RESPONSIBILITIES:

A concreting (ground beam) supervisor is responsible to 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 drawings 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 and prepare and compile reports for site activities including QA QC documents, SHE documents.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Material knowledge (grade and type of concrete)
- Tools usage
- Mixing techniques
- Concrete mix ratio
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal

Skills:

- Possess mixing techniques
- Interpret construction drawing
- Supervise subordinates' work performance

Attributes (Attitude/Safety/Environmental):

- High level of commitment and strong team player
- Result oriented mind-set

MSIC GROUP : 410
AREA : Concreting (Ground Beam)
JOB TITLE : Coordinator
LEVEL : 4

RESPONSIBILITIES:
A concreting (ground beam) coordinator is responsible to plan physical work activities, compile and analyse submissions by site supervisor, submit technical report and progress report and issue to superior, understand and interpret approved construction drawing, specification and bill of quantity (BQ), coordinate and inspect shop drawing production, assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing, identify variation order, assist in preparing progress claim for construction work, attend technical and site meetings, identify and solve interfacing problem and assist in producing as-built drawing.

Knowledge:
- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Material knowledge (grade and type of concrete)
- Mixing techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal
- Productivity
- Knowledge on other trades' (timber, steel, concrete, mechanical & electrical) requirements

Skills:
- Apply mixing techniques
- Interpret construction drawing
- Plan and forecast construction activities

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 : 410
AREA : Formwork (In Situ Work)
JOB TITLE : Carpenter
LEVEL : 2

RESPONSIBILITIES:
A formwork (in-situ work) carpenter is responsible to perform tasks according to approved method statement, carry out timber work, measure, mark and record measurements, carry out preparation for testing, assembly and installation as per approved construction drawing, perform routine maintenance, adhere to safety and security procedures, follow standard operating procedures and prepare daily work report.

Knowledge:
- Basic mathematics
- Material knowledge (types of timber)
- Basic Safety Health Environment requirements
- Jointing techniques
- Construction drawing
- Tools usage

Skills:
- Apply carpentry skills
- Apply jointing 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 : 410
AREA : Formwork (In Situ Work)
JOB TITLE : Supervisor
LEVEL : 3

RESPONSIBILITIES:

A formwork (in-situ work) supervisor is responsible to assist in planning physical work activities in the respective trades, prepare daily work schedule, assign work based on job tasks, brief workers on work procedures, read and interpret construction drawings 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 and prepare and compile reports for site activities including QA QC documents, SHE documents.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- construction drawing
- Tools usage
- Relevant timber specification
- Jointing techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal

Skills:

- Apply carpentry skills
- Apply jointing techniques
- Interpret construction drawing
- Supervise subordinates' work performance

Attributes (Attitude/Safety/Environmental):

- High level of commitment and strong team player
- Result oriented mind-set

MSIC GROUP : 410
AREA : Formwork (In Situ Work)
JOB TITLE : Coordinator
LEVEL : 4

RESPONSIBILITIES:

A formwork (in-situ work) coordinator is responsible to compile and analyse as per submission by site supervisor, submit technical and progress reports and issues to superior, understand and interpret on approved construction drawing (modular) specification, identify variation order, assist in identifying any errors and discrepancies on construction drawing, prepare progress claim for construction work, variation order on site and coordinate and inspect shop drawing production and competencies.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Relevant timber specification
- Jointing techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and productivity appraisal
- Knowledge on other trade (timber, steel, concrete, mechanical & electrical) requirement

Skills:

- Apply carpentry skills
- Apply jointing techniques
- Interpret construction drawing
- Plan and forecast construction activities

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 : 410
AREA : Rebar/spacer (In Situ Work)
JOB TITLE : Bar bender
LEVEL : 2

RESPONSIBILITIES:

A rebar (in-situ work) 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 : 410
AREA : Rebar/spacer (In Situ Work)
JOB TITLE : Supervisor
LEVEL : 3

RESPONSIBILITIES:

A rebar (in-situ work) supervisor is responsible to 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 drawings 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 and prepare and compile reports for site activities including QA QC documents and SHE documents.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Material knowledge (types of rebar, BRC etc)
- Cutting, bending & assembling techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal

Skills:

- Apply bending skills
- Apply assembling techniques
- Interpret construction drawing
- Supervise subordinates' work performance

Attributes (Attitude/Safety/Environmental):

- High level of commitment and strong team player
- Result oriented mind-set

MSIC GROUP : 410
AREA : Rebar/spacer (In Situ Work)
JOB TITLE : Coordinator
LEVEL : 4

RESPONSIBILITIES:
A rebar (in-situ work) coordinator is responsible to plan physical work activities, compile and analyse submissions by site supervisor, submit technical and progress reports and issue to superior, understand and interpret approved construction drawing, specification and bill of quantity (BQ), coordinate and inspect shop drawing production, assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing, identify variation order, assist in preparing progress claim for construction work, attend technical and site meetings, identify and solve interfacing problems and assist in producing as-built drawing.

Knowledge:
- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Material knowledge (types of rebar, BRC etc)
- Cutting, bending & assembling techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and productivity appraisal
- Knowledge on other trade (timber, steel, concrete, mechanical & electrical) requirement

Skills:
- Apply bending skills
- Apply assembling techniques
- Interpret construction drawing
- Plan and forecast construction activities

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 : 410
AREA : Concreting (In Situ Work)
JOB TITLE : Concreter
LEVEL : 2

RESPONSIBILITIES:
An in-situ work concreter is responsible to 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 and perform routine maintenance.

Knowledge:
- Basic mathematics
- Material knowledge (grade and type of concrete)
- Concrete raw materials
- Basic Safety Health Environment requirements
- Mixing techniques
- Concrete mix ratio
- Compaction method
- Curing method
- Mould release agent
- Construction drawing
- Tools usage

Skills:
- Apply mixing 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 : 410
AREA : Concreting (In Situ Work)
JOB TITLE : Supervisor
LEVEL : 3

RESPONSIBILITIES:

A concreting (in-situ work) supervisor is responsible to assist in planning physical work activities in the respective trade, prepare daily work schedule, assign work based on job tasks, brief workers on work procedures, read and interpret construction drawings 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 and prepare and compile reports for site activities including QA QC documents and SHE documents.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Material knowledge (grade and type of concrete)
- Tools usage
- Mixing techniques
- Concrete mix ratio
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal

Skills:

- Apply mixing techniques
- Interpret construction drawing
- Supervise subordinates' work performance

Attributes (Attitude/Safety/Environmental):

- High level of commitment and strong team player
- Result oriented mind-set

MSIC GROUP : 410
AREA : Concreting (In Situ Work)
JOB TITLE : Coordinator
LEVEL : 4

RESPONSIBILITIES:

A concreting (in-situ work) coordinator is responsible to plan physical work activities, compile and analyse submissions by site supervisor, submit technical and progress reports and issues to superior, understand and interpret approved construction drawing, specification and bill of quantity (BQ), coordinate and inspect shop drawing production, assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing, identify variation order, assist in preparing progress claim for construction work, attend technical and site meetings, identify and solve interfacing problems and assist in producing as-built drawing.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Material knowledge (grade and type of concrete)
- Mixing techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal
- Productivity
- Knowledge on other trades' (timber, steel, concrete, mechanical & electrical) requirements

Skills:

- Apply mixing techniques
- Interpret construction drawing
- Plan and forecast construction activities

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 : 410
AREA : Cutting/Welding (Steel Work)
JOB TITLE : Welder
LEVEL : 2

RESPONSIBILITIES:

A welder is responsible to 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, to select, position and align parts of fixtures to be welded, carry out welding works, paint the joint part, adhere to safety and security procedure and follow Standard Operating Procedure.

Knowledge:

- Basic mathematics
- Material knowledge (grade and type)
- Welding methods & techniques
- Rust treatment method
- Basic NDT testing
- Basic Safety Health Environment requirements
- Construction drawing
- Tools usage
- Welding material storage requirements

Skills:

- Apply welding 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 : 410
AREA : Cutting/Welding (Steel Work)
JOB TITLE : Supervisor
LEVEL : 3

RESPONSIBILITIES:

A welding supervisor is responsible to 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 drawings 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 and prepare and compile reports for site activities including QA QC documents and SHE documents.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Material knowledge (grade and type)
- Welding methods & techniques
- Rust treatment method
- Basic NDT testing
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal

Skills:

- Apply welding techniques
- Interpret construction drawing
- Supervise subordinates' work performance

Attributes (Attitude/Safety/Environmental):

- High level of commitment and strong team player
- Result oriented mind-set

MSIC GROUP : 410
AREA : Cutting/Welding (Steel Work)
JOB TITLE : Coordinator
LEVEL : 4

RESPONSIBILITIES:

A welding coordinator is responsible to plan physical work activities, compile and analyse submissions by site supervisor, submit technical t and progress reports and issues to superior, understand and interpret approved construction drawing, specification and bill of quantity (BQ), coordinate and inspect shop drawing production, assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing, identify variation order, assist in preparing progress claim for construction work, attend technical and site meetings, identify and solve interfacing problems and assist in producing as-built drawing.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Material knowledge (grade and type)
- Welding methods & techniques
- Rust treatment method
- Basic NDT testing
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal
- Knowledge on other trade (timber, steel, concrete, mechanical & electrical) requirement

Skills:

- Apply welding techniques
- Interpret construction drawing
- Plan and forecast welding related activities

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 : 410
AREA : Installation (Steel Work)
JOB TITLE : Installer
LEVEL : 2

RESPONSIBILITIES:
A steel work installer is responsible perform work as per construction drawing and method statement, request for material storage area, perform installation of steel structure, carry out welding works, carry out hoisting work, paint the joint part, carry out support work for steel structure, adhere to safety and security procedure and follow Standard Operating Procedure.

Knowledge:
- Basic mathematics
- Material knowledge (grade, type & gauge of steel)
- Steel structure installation techniques and specification
- Welding and jointing techniques
- Basic Safety Health Environment requirements
- Construction drawing
- Tools usage

Skills:
- Install steel structures
- 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 : 410
AREA : Installation (Steel Work)
JOB TITLE : Supervisor
LEVEL : 3

RESPONSIBILITIES:

A steel work installation supervisor is responsible to 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 drawings 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 and prepare and compile reports for site activities including QA QC documents and SHE documents.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Material knowledge (grade, type & gauge of steel)
- Steel structure installation techniques and specification
- Welding and jointing techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal

Skills:

- Install steel work structures
- Interpret construction drawing
- Supervise subordinates' work performance

Attributes (Attitude/Safety/Environmental):

- Ability to supervision skills
- High level of commitment and strong team player
- Result oriented mind-set

MSIC GROUP : 410
AREA : Installation (Steel Work)
JOB TITLE : Coordinator
LEVEL : 4

RESPONSIBILITIES:
A steel work installation coordinator is responsible to plan physical work activities, compile and analyse submissions by site supervisor, submit technical report and progress report and issue to superior, understand and interpret approved construction drawing, specification and bill of quantity (BQ), coordinate and inspect shop drawing production, assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing, identify variation order, assist in preparing progress claim for construction work, attend technical and site meetings, identify and solve interfacing problems and assist in producing as-built drawing.

Knowledge:
- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Material knowledge (grade and type)
- Welding methods & techniques
- Rust treatment method
- Basic NDT testing
- QA and QC knowledge
- Project specifications
- Report writing
- Work supervision and appraisal
- Knowledge on other trade (timber, steel, concrete, mechanical & electrical) requirement

Skills:
- Install steel work structures
- Interpret construction drawing
- Plan and forecast steel work installation activities

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 : 410
AREA : Cutting/Joining (Timber Work)
JOB TITLE : Joiner
LEVEL : 2

RESPONSIBILITIES:

A joiner is responsible to perform work as per construction drawing and method statement, request for material storage area, carry out cutting work, carry out cutting of timber joineries, carry out hoisting work, carry out support work for timber structure, paint the joint part, adhere to safety and security procedure and follow Standard Operating Procedure.

Knowledge:

- Basic mathematics
- Material knowledge (types of timber)
- Basic Safety Health Environment requirements
- Jointing techniques
- Construction drawing
- Tools usage

Skills:

- Apply jointing 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 : 410
AREA : Cutting/Joining (Timber Work)
JOB TITLE : Supervisor
LEVEL : 3

RESPONSIBILITIES:

A cutting (timber work) supervisor is responsible to 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 drawings 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 and prepare and compile reports for site activities including QA QC documents, SHE documents.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Relevant timber specification
- Jointing techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal

Skills:

- Apply carpentry skills
- Apply jointing techniques
- Interpret construction drawing
- Supervise subordinates' work performance

Attributes (Attitude/Safety/Environmental):

- High level of commitment and strong team player
- Result oriented mind-set

MSIC GROUP : 410
AREA : Cutting/Joining (Timber Work)
JOB TITLE : Coordinator
LEVEL : 4

RESPONSIBILITIES:

A timber work coordinator is responsible to plan physical work activities, compile and analyse submissions by site supervisor, submit technical and progress reports and issues to superior, understand and interpret approved construction drawing, specification and bill of quantity (BQ), coordinate and inspect shop drawing production, assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing, identify variation order, assist in preparing progress claim for construction work, attend technical and site meetings, identify and solve interfacing problems and assist in producing as-built drawing.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Relevant timber specification
- Jointing techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and productivity appraisal
- Knowledge on other trade (timber, steel, concrete, mechanical & electrical) requirement

Skills:

- Apply carpentry skills
- Apply jointing techniques
- Interpret construction drawing
- Plan and forecast timber work activities

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 : 410
AREA : Installation (Timber Work)
JOB TITLE : Installer
LEVEL : 2

RESPONSIBILITIES:
A timber work installer is responsible to perform work as per construction drawing and method statement, request for material storage area, perform installation of timber structure, carry out fixing of timber joineries, carry out hoisting work, paint the joint part, carry out support work for timber structure, adhere to safety and security procedure and follow Standard Operating Procedure.

Knowledge:
- Basic mathematics
- Material knowledge (grade, type & gauge of steel)
- Steel structure installation techniques and specification
- Welding and jointing techniques
- Basic Safety Health Environment requirements
- Construction drawing
- Tools usage

Skills:
- Apply timber work installation 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 : 410
AREA : Installation (Timber Work)
JOB TITLE : Supervisor
LEVEL : 3

RESPONSIBILITIES:

A timber work installation supervisor is responsible to 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 drawings 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 and prepare and compile reports for site activities including QA QC documents and SHE documents.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Relevant timber specification
- Jointing techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal

Skills:

- Apply carpentry skills
- Apply jointing techniques
- Interpret construction drawing
- Supervise subordinates' work performance

Attributes (Attitude/Safety/Environmental):

- High level of commitment and strong team player
- Result oriented mind-set

MSIC GROUP : 410
AREA : Installation (Timber Work)
JOB TITLE : Coordinator
LEVEL : 4

RESPONSIBILITIES:

A timber work installation coordinator is responsible to plan physical work activities, compile and analyse submissions by site supervisor, submit technical report and progress report and issue to superior, understand and interpret approved construction drawing, specification and bill of quantity (BQ), coordinate and inspect shop drawing production, assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing, identify variation order, assist in preparing progress claim for construction work, attend technical and site meetings, identify and solve interfacing problems and assist in producing as-built drawing.

Knowledge:

- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Relevant timber specification
- Jointing techniques
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and productivity appraisal
- Knowledge on other trade (timber, steel, concrete, mechanical & electrical) requirement

Skills:

- Apply carpentry skills
- Apply jointing techniques
- Interpret construction drawing
- Plan and forecast timber work installation activities

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 : 410
AREA : IBS Reusable Formwork
JOB TITLE : Installer
LEVEL : 2

RESPONSIBILITIES:
An IBS reusable formwork installer is responsible to perform work as per construction drawing and method statement, request for formwork material storage area, apply mould release oil, carry out hoisting work, perform installation of formwork, carry out support/bracing work for formwork, check verticality, horizontality and orientation of formwork, adhere to safety and security procedure and follow Standard Operating Procedure.

Knowledge:
- Basic mathematics
- Material knowledge (reusable formwork material)
- Reusable formwork installation techniques and specification
- Basic Safety Health Environment requirements
- Construction drawings
- Tools usage
- Reusable formwork handling and storage requirements

Skills:
- Apply IBS reusable formwork installation 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 : 410
AREA : IBS Reusable Formwork
JOB TITLE : Supervisor
LEVEL : 3

RESPONSIBILITIES:
An IBS reusable formwork supervisor is responsible to 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 drawings 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 and prepare and compile reports for site activities including QA QC documents and SHE documents.

Knowledge:
- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal
- Basic mathematics
- Material knowledge (reusable formwork material)
- Reusable formwork installation techniques and specification
- Basic Safety Health Environment requirements
- Construction drawing
- Tools usage
- Reusable formwork handling and storage requirements

Skills:
- Apply IBS reusable formwork installation techniques
- Interpret construction drawing
- Supervise subordinates work performance

Attributes (Attitude/Safety/Environmental):
- High level of commitment and strong team player
- Result oriented mind-set

MSIC GROUP : 410
AREA : IBS Reusable Formwork
JOB TITLE : Coordinator
LEVEL : 4

RESPONSIBILITIES:
An IBS reusable formwork coordinator is responsible to plan physical work activities, compile and analyse submissions by site supervisor, submit technical and progress reports and issues to superior, understand and interpret approved construction drawing, specification and bill of quantity (BQ), coordinate and inspect shop drawing production, assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing, identify variation order, assist in preparing progress claim for construction work, attend technical and site meetings, identify and solve interfacing problems and assist in producing as-built drawing.

Knowledge:
- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Project specification
- Setting out
- Interfacing method
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and productivity appraisal

Skills:
- Apply IBS reusable formwork installation techniques
- Interpret construction drawing
- Plan and forecast IBS reusable framework installation activities

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 : 410
AREA : IBS Blockwork
JOB TITLE : Installer
LEVEL : 2

RESPONSIBILITIES:

An IBS blockwork installer is responsible to carry-out blockworks activities including blockworks hand tools and materials, preparation, working area setting out, adhesive mixing, blockworks installation and other requirements to ensure effective and efficient blockworks activities, store blockworks materials, perform blockworks material storage, maintain and upkeep blockworks equipment, install damp proof material, perform wall base and block pier setting out, prepare blockworks adhesive, perform installation of blockworks such as straight wall, door and window, provide opening for mechanical & electrical services and perform housekeeping.

Knowledge:

- Basic mathematics
- Material knowledge (blockwork material)
- Delivery and stacking schedule
- Blockwork handling and storage requirements
- Tools usage
- Construction drawing
- Blockwork installation techniques
- Basic Safety Health Environment requirements
- Setting out techniques

Skills:

- Apply IBS blockwork installation 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 : 410
AREA : IBS Blockwork
JOB TITLE : Supervisor
LEVEL : 3

RESPONSIBILITIES:
An IBS blockwork supervisor is responsible to 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 drawings 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 and prepare and compile reports for site activities including QA QC documents and SHE documents.

Knowledge:
- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal
- Basic mathematics
- Material knowledge (blockwork material)
- Delivery and stacking schedule
- Blockwork handling and storage requirements
- Tools usage
- Construction drawing
- Blockwork installation techniques
- Basic Safety Health Environment requirements
- Setting out techniques

Skills:
- Apply IBS blockwork installation techniques
- Interpret construction drawing
- Supervise subordinates' work performance

Attributes (Attitude/Safety/Environmental):
- High level of commitment and strong team player
- Result oriented mind-set

MSIC GROUP : 410
AREA : IBS Blockwork
JOB TITLE : Coordinator
LEVEL : 4

RESPONSIBILITIES:
An IBS blockwork coordinator is responsible to plan physical work activities, compile and analyse submissions by site supervisor, submit technical report and progress report and issue to superior, understand and interpret approved construction drawing, specification and bill of quantity (BQ), coordinate and inspect shop drawing production, assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing, identify variation order, assist in preparing progress claim for construction work, attend technical and site meetings, identify and solve interfacing problems and assist in producing as-built drawing.

Knowledge:
- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Project specification
- Setting out
- Interfacing method
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and productivity appraisal

Skills:
- Possess IBS blockwork installation techniques
- Interpret construction drawing
- Plan and forecast IBS blockwork installation activities

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 : 410
AREA : IBS Precast Concrete System
JOB TITLE : Installer
LEVEL : 2

RESPONSIBILITIES:

An IBS concrete system installer is responsible to follow work instruction and job requirement, prepare precast component storage area in his/ her area of responsibility during site mobilization, install levelling pad, levelling bolt, precast wall panel, temporary propping, lay backer rod, pack cement mortar, install precast column, precast staircase, precast slab, precast gutter, precast bathroom to maximum productivity achievement within quality requirement, carry out joint grouting, wet joint casting, concrete slab topping and apply joint sealant during installation works to maximum productivity achievement within quality requirement, perform site quality control within his/ her area of responsibility such as perform starter bar defect rectification and carry out precast component crack repair works to comply with precast component quality standard and able to abide by safety rules and regulations.

Knowledge:

- Basic mathematics
- Material knowledge (precast concrete component)
- Precast concrete installation techniques and specification
- Basic Safety Health Environment requirements
- Construction drawing
- Tools usage
- Precast concrete handling and storage requirements
- Jointing techniques
- IBS precast concrete structures delivery and stacking schedule

Skills:

- Apply IBS installation 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 : 410
AREA : IBS Precast Concrete System
JOB TITLE : Supervisor
LEVEL : 3

RESPONSIBILITIES:
An IBS precast concrete system supervisor is responsible to 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 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 and prepare and compile reports for site activities including QA QC documents, SHE documents.

Knowledge:
- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal
- Basic mathematics
- Material knowledge (precast concrete component)
- Precast concrete installation techniques and specification
- Basic Safety Health Environment requirements
- Construction drawing
- Tools usage
- Precast concrete handling and storage requirements
- Jointing techniques
- IBS precast concrete structures delivery and stacking schedule

Skills:
- Apply IBS concrete system installation techniques
- Interpret construction drawing
- Supervise subordinates' work performance

Attributes (Attitude/Safety/Environmental):
- High level of commitment and strong team player
- Result oriented mind-set

MSIC GROUP : 410
AREA : IBS Precast Concrete System
JOB TITLE : Coordinator
LEVEL : 4

RESPONSIBILITIES:
An IBS precast concrete system coordinator is responsible to plan physical work activities, compile and analyse submissions by site supervisor, submit technical and progress reports and issues to superior, understand and interpret approved construction drawing, specification and bill of quantity (BQ), coordinate and inspect shop drawing production, assist in identifying and reporting any errors or discrepancies on construction drawing/shop drawing, identify variation order, assist in preparing progress claim for construction work, attend technical and site meetings, identify and solve interfacing problems and assist in producing as-built drawing.

Knowledge:
- Work planning and scheduling
- Safety Health Environment requirements
- Basic computer knowledge
- Construction drawing
- Tools usage
- Project specification
- Setting out
- Interfacing method
- QA and QC knowledge
- Project specification
- Report writing
- Work supervision and appraisal
- IBS precast concrete structures delivery and stacking schedule

Skills:
- Apply IBS concrete system installation techniques
- Interpret construction drawing
- Plan and forecast IBS concrete system installation activities

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