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FACTORS CONTRIBUTING TO SAFETY AND HEALTH ASSESSMENT FOR GOVERMENT PROJECT FROM THE PERSPECTIVE OF CONSTRUCTION PLAYER

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ABSTRACT

Assessment of safety and health performance for a government's construction project is a major issue in malaysia due to importance of promoting good safety culture among construction companies. This paper aims to identify factors that can be used in an assessment tool for evaluating level of safety and health performance and determine its validity by using both qualitative and quantitative method in the form of semi-structured interviews and survey. Literature review was made to identify the relevant factors contributing to safety and health on-site. The factors were then presented to an expert panel in a semi-structured interview and to several safety and health personnel involved with government projects for verification. Results from the interview and survey are analysed and the factors are verified to be viable for assessment of safety and health performance

KEYWORDS: Assessment Method, Construction, Safety And Health

1. INTRODUCTION

Safety and Health in construction is becoming a major concern for Malaysia, as made evident by the launching of the Construction Industry Master Plan 2006-2015 (CIMP) led by the Construction Industry Development Board (CIDB). One of the strategic thrusts made in the plan is the focus on striving for the highest standard of quality, occupational safety and health, and environmental practices. In order to properly evaluate the level of performance of construction companies in terms of their safety and health implementation, a standardized and proper assessment method must be applied. The assessment of safety and health performance for construction projects, especially under government jurisdiction, is essential in ensuring transparency in the process of appointing a construction company. For all government construction project valued above RM20 million, the submission of a Safety and Health Plan (SH Plan) is mandatory. This document is the first step of implementation for safety and health in the construction site. Therefore, an proper evaluation method for this document will enable the government to better monitor the level of safety performance expected from the appointed construction company. This study aims to identify factors relevant to safety and health for a construction project and apply them to creating a safety and health assessment of the submitted SH Plan.

2. LITERATURE REVIEW

The construction sector in Malaysia has seen a very consistent trend in terms of demands despite economic fluctuations or recessions. Due to the nature of the construction sector itself, which is volatile in terms of returns due to long development period, companies might have to cope with increased costs of materials of manpower. Therefore, having another avenue in terms of preventing additional costs due to health and safety related incidents would provide a more stable way of increasing profit margins. Figure 1 shows the growth at which the Malaysian's construction sector has gone through, causally implying a higher demand for improved safety performance.

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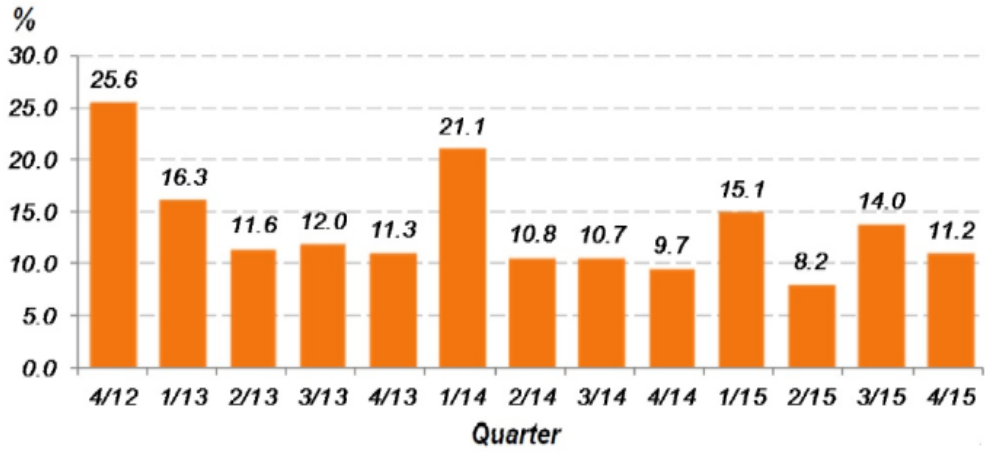

Figure 1. Malaysia's Construction Sector Annual Percentage Change, Q4 2012 to Q4 2015 [1]

Despite the spike in special trades for construction sector as shown in figure 2, the growth for each type of activity has been largely consistent with no particular trade having a clear majority of shares over the others.

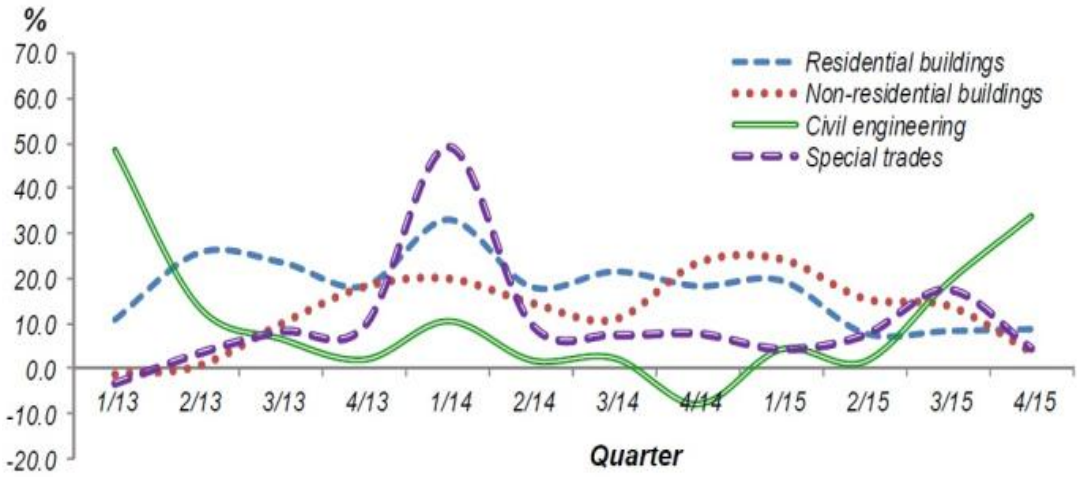

Figure 2. Malaysia's Construction Sector Annual Percentage Change by Type of Activity, Q4 2012 - Q4 2015 [1]

In terms of location, three states in Malaysia has shown significant difference in value of construction work done. Johor led the way due to the works done with the Iskandar Malaysia development region and Pengerang Integrated Petroleum Complex. As shown by figure 3, the other two states are Selangor and Wilayah Persekutuan, with the other states showing various levels of investment value in terms of construction works.

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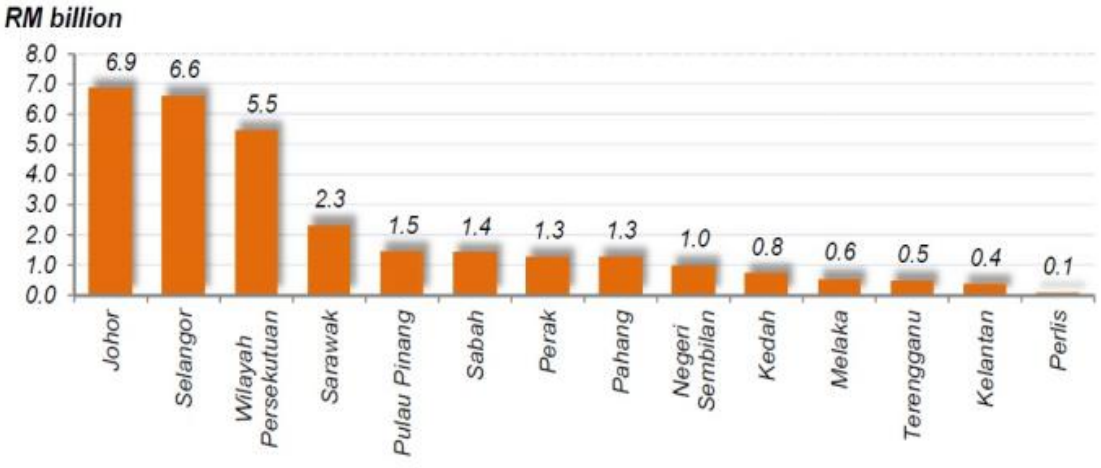

Figure 3. Value of Construction Work done by location, Q4 2015 [1]

In terms of construction work done by project owner, the private sector invested more in terms of value, as shown in figure 4. Despite that, both the private and public sector showed consistent growth from Q4 2012 to Q4 2015.

Figure 4. Value of Construction Work done by project owner, Q4 2012 - Q4 2015 [1]

In a typical construction project, there are two documents that is usually prepared in terms of safety and health, Safety and Health Plan and Monthly Report. An SH Plan is a written document establishing the details of implementing any safety and health programs for the duration of the project. The details typically include possible hazards during work along with all company policies, controls and work practices selected to either eliminate or minimize those hazards. In its simplest form, SH plan should describe the process for identifying the physical and health hazards that can cause injury to workers, the steps and procedures prepared to avoid the injury and to handle them should any occur. The safety and health monthly report is typically drafted with relevant details from the SH plan to illustrate the ongoing effort of maintaining proper safety and health performance throughout the construction project. It typically contains statistics regarding safety and health-related matters such as incident or accident and injuries on-site. These statistics are a way to measure how the site is progressing and performing from a safety and health point of view. The SH report is prepared and submitted monthly to the relevant parties.

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In Malaysia, the Public Works Department (PWD) requires any project costing more than RM20 million to submit a Safety and Health (SH) Plan prior to start of construction. Another requirement for such a project, stated under the Occupational Safety and Health (OSHA) Act 1994, is the appointment of a Safety and Health Officer (SHO). SH plan in terms of PWD project will include all details of safety and health-related matters pertaining to the project. After the SH plan is approved and construction begins, a monthly SH report that outlines the details of any SH related issues on site is required. The report itself is submitted to outline the on-site compliance of safety measures detailed in the SH plan. If any of the measures are not followed on-site, the consultant appointed by the government issues an NCR for the contractor to comply with. Any safety-related NCR will be logged and recorded in the SH report to be rectified by the contractor [2].

Safety performance of a project under JKR supervision is usually measured based upon the amount of NCR (Non-Conformance Report) submitted and closed by the contractor at the end of project, provided no other serious issue presented itself, such as fatal accidents. At the end of the project, the list of NCRs submitted and closed by the contractor forms a timeline on which the performance of the contractor can be evaluated. A safety audit, both internal and external, may also be made according to government requirements for selected projects and site to allow a more thorough evaluation of a project's safety performance. In its current form, the method to measure the safety performance of a project, especially under government supervision does not have any standard baseline as reference. The report produced at the end of the project denoting how a company performed, safety-wise, does not have any bearing upon which they will be considered for future projects. In terms of the documents themselves, the SH Plan and monthly SH report are sufficiently adequate in terms of evaluating a construction project's safety performance. However, a method in which to evaluate how the documents are prepared and maintained is insufficient in its current form [3].

Despite the presence of a safety guideline stated in the OSHA 1994 Act drafted using worldwide safety standards as used by countries such as UK and Australia, evaluating the level of compliance to these guidelines is still an issue. Without a proper standard evaluation method for the actual safety and health performance of the government project, it is difficult to take into consideration the level of performance from one project to a possible future award for the same contractor. Therefore, by establishing a standard benchmark tool, all of the accumulated record and data can be better utilized for future government project tendering [2].

Local authorities can be an important factor in how safety and health performance is improved for construction projects [4]. The Occupational Safety and Health Act 1994 is enforced by government officers by conducting inspection at the relevant sites. This is to ensure that the corresponding company comply with the imposed rules and regulations therefore increasing workplace safety. The health and policy statement should be easily understandable which can be achieved by using clear and simple language [5]

Accident prevention in construction can be achieved by implementing the proper steps according to safety and health regulations and being aware of several major factors. These factors which are considered risks consists of actual physical and environmental hazards, human factors, and subpar safety standards, communication breakdown within a single trade or between two or more trades. These risks can be identified and analysed by implementing a Risk Analysis system. Risk Analysis is a systematic use of available information to determine how often specified events may occur and what is the magnitude of their consequences. In order to improve site safety, any and all accidents or potential accidents must be investigated, analysed and the resulting report be taken as a step in preventing any future occurrence of that particular accident [6].

The implementation of safety and health on-site within an organization can been affected by employees' concern and demands. It is found that by encouraging workers' participation in the implementation of safety and health matters can lower the rate of on-site injury [7]. Any implementation of safety & health program involving separate contractors needs a more streamlined and thorough approach compared to a more static workforce. As contractors are usually hired based on specialized works, a general approach to safety and health would be insufficient in handling possible incidents due to the complexity of said works. Extra care must be taken to ensure safety would always be a priority in their work practices and that adequate monitoring is made [8].

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Another important factor is the implementation of personal protective equipment, or PPE on site. Their function is to protect workers from risk of injury by minimizing exposure to hazards in by way of wearing protective equipments. PPE should not be considered the be-all and end-all of safety and health measure on-site but used alongside proper engineering and management controls to establish an adequate safety and health system for workers. Personal protective equipment (PPE) should be provided for the workers engaging in works identified to pose risk of injury, depending on the results of hazard identification, risk analysis and determining control (HIRADC) forms. The provision of general PPE is not limited to workers, but also any visitors on-site. The usage of PPE must be monitored unless where it is not required, such as in the office or rest area [8].

A good safety management system will include safety training as one of its most important component. Training employees with the knowledge, skills and attitude, at all levels which would enable them to perform their duties in a safe and efficient manner is the objective of a safety training program. Employees at all levels including managers, supervisors, safety personnel, contractors and general workers should participate in safety training [9].

Starting from the commissioning of the project itself, the client must be made aware of the safety requirements and selection of the contractor must also take into account their safety performance in previous projects. After construction has started, safety and health programs must be implemented throughout the entire lifespan of the project to ensure no incidents occur for both the benefit of the client and also the contractor [10]. The presence of safety supervisors on-site to continuously monitor and implement safety precautions can help bridge the gap between upper management and the workers.Such implementation and monitoring of safety and health programs falls upon the main contractor and its appointed safety personnel [11].

Creating a safety and health committee that consists of representatives of the client, main contractor, subcontractor and also worker can further foster trust and communication between parties involved in the project. Site inspections made by safety officer and also the upper managers can further improve the level of site safety performance [12]. Safety and health problems on-site can be resolved and accident prevention can be improved with continuous monitoring and frequent safety meetings [9].

Proper record-keeping of safety issues, including accidents is important due to their ability to provide valuable insights that can be utilized to control or eliminate future possible hazards [13]. It was a consensus among respondents in a survey made in the USA that improved safety performance can be achieved by conducting proper accident investigations. Another study in Hong Kong found that a major factor in lowering rate of site accident is the execution of accident reporting and investigation program. Similar accidents can be prevented by proper investigation on the nature of the accident and its underlying cause on-site. Results from the investigation can also be utilized to create preventive measures and checklists to ensure it does not occur again [14].

3. RESEARCH METHOD

This research applies both qualitative and quantitative approach in collecting data for use in developing the assessment method. A literature review was made of previous research concerning safety and health implementation in a construction site. Any factors or variables that affected the level of safety performance on-site, either positively or negatively, are collated or formed into a theoretical framework.

The theoretical framework was then presented to an expert panel consisting of three certified government safety officers for verification and input in a semi-structured interview session. Once the variables contained in the framework has been verified in terms of their validity in affecting safety and health performance on-site, a survey was made to further validate the findings quantitatively.

The framework was made into a questionnaire and distributed among safety and health personnel involved with government projects, either through the consultant, main contractor, sub-contractor or affiliates with the government. The results are filtered by removing any respondents aged less than 25 years old or possessing less than 1 year working experience concerning safety and health matters. Out of a total of 320 forms distributed, 220 forms were returned and 27 responses were filtered out due to respondent being younger than 25 years old

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and having less than 1 year of experience in safety and health. At the end of the survey, 193 valid samples were obtained and analysed. The breakdown of the respondents are shown in figure 6. The survey results along with the framework were then presented once more to the expert panel for initial drafting of the proposed assessment tool. An assessment tool for measuring the safety performance of Safety and Health Plan submitted by the contractor was designed by applying all of the input given by the expert panel.

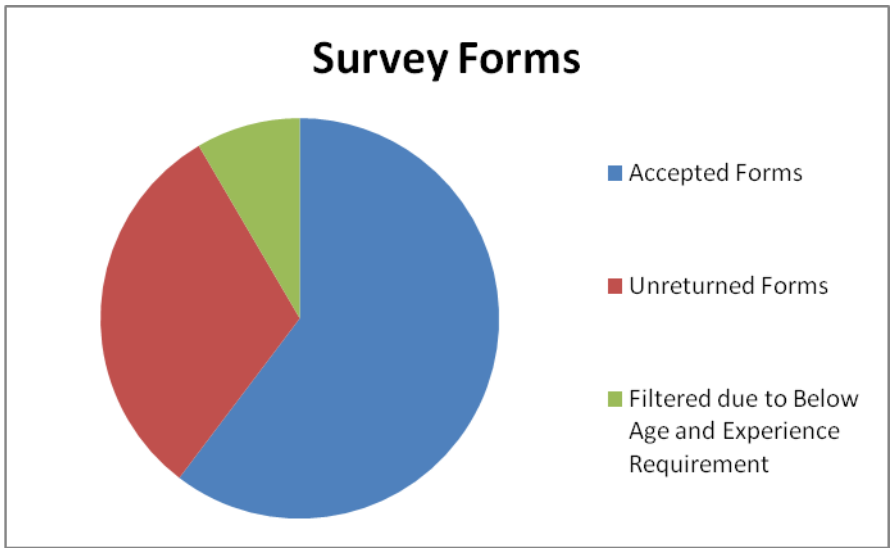

Figure 6. Breakdown of Survey Form Distribution

4. RESULT AND DISCUSSION

After results from the survey is analysed, all of the values are converted into a weightage value based upon their response. Weightage, or RII value, is calculate by using the following:

$$RII = \frac{\sum W}{A * N}$$

where 0< RII < 1

The weightage values for all of the factors included in the survey is shown in table 1. Based on all the values obtained, it is decided that any factors with weightage above 0.7 is considered valid for usage in the assessment method.

Table 1. Results of Survey

CATEGORY			REQUIREMENT		RESULT OF IMPORTANCE LEVEL					TOTAL	TOTAL SCORE	UNIT WEIGHT
					1	2	3	4	5			
POLICY	P1	INTRODUCTION	a	Project Description and its durations	0	0	34	66	93	**193**	**831**	**0.86114**
			b	Company Detail with experiences related to safety and health in construction	0	0	34	63	96	**193**	**834**	**0.864249**

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	P 2	SAFETY AND HEALTH SCOPE	a	Description of Project	0	0	35	81	77	**193**	**814**	**0.843523**
			b	statement of Commitment on Safety and Health	0	0	30	68	95	**193**	**837**	**0.867358**
			c	Brief Description on the scope Safety and Health Plan	0	0	29	76	88	**193**	**831**	**0.86114**
	P 3	OBJECTIVE SAFETY AND HEALTH	a	commitment to comply with safety and health legislation, act, rules and regulation.	0	0	37	76	80	**193**	**815**	**0.84456**
			b	initiative to promoting consistence and productive safety and health environment	0	0	45	77	71	**193**	**798**	**0.826943**
			c	strategy to encourage healthy working culture and procedure	0	0	40	70	83	**193**	**815**	**0.84456**
			d	describe continual improvement in safety and health management	0	0	30	67	96	**193**	**838**	**0.868394**
	P 4	SAFETY AND HEALTH POLICY	a	General Policy Statement manifesting commitment manage safety and health	0	0	29	87	77	**193**	**820**	**0.849741**
			b	function, roles and responsibilities of Safety Management Team	0	0	34	79	80	**193**	**818**	**0.847668**
			c	overall Safety and Health Management system to achieve aim and objectives of the policy	0	0	33	74	86	**193**	**825**	**0.854922**
LEGISLATION	L 1	LEGISLATION, RULES AND REGULATION	a	Enforcement management related to construction works at all stages	0	0	53	73	67	**193**	**786**	**0.814508**
			b	outline compliance of Act, Rules & Regulation (with clause) to specific construction works at all stages related to safety and health	0	0	39	75	79	**193**	**812**	**0.841451**
			c	presented compliance to local government/authorities requirement	0	0	37	75	81	**193**	**816**	**0.845596**
			d	attachment of documentation of obtaining consent/approval/ permission/from related local	0	0	35	76	82	**193**	**819**	**0.848705**

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				government/authorities									
			e	provide documentation of the certified Responsible Competent Person assigned as enforcement safety officer	0	0	46	66	81	**193**	**807**	**0.836269**
			f	outline frequencies and schedule of inspection, monitoring, surveillance, assessment and audit of enforcement requirement related to legislation act, rules and regulation	0	0	44	72	77	**193**	**805**	**0.834197**
			g	describe resource planning for enforcement requirement with specific compliance to legislation act, rules and regulation	0	0	38	68	87	**193**	**821**	**0.850777**
	L2	**PROBIHITED SUBSTANCE**	a	enforcement strategies to prohibit use of Drugs	0	0	38	72	83	**193**	**817**	**0.846632**
			b	enforcement management strategies to prohibit the consumption of alcoholic drinks/substances	0	0	50	71	72	**193**	**794**	**0.822798**
			c	enforcement management strategies to prohibit the use of restricted medicine	0	0	44	78	71	**193**	**799**	**0.827979**
MANAGEMENT	**M1**	**ROLES AND RESPONSIBILITIES**	a	roles and responsibilities on safety and health management of each parties involved	0	0	35	80	78	**193**	**815**	**0.84456**
			b	detail of duties for each designated post in safety and health management team	0	0	25	82	86	**193**	**833**	**0.863212**
			c	Organisational Chart of safety and health management	0	0	39	73	81	**193**	**814**	**0.843523**
			d	valid documentation for evidence of appointment and competent person	0	0	42	78	73	**193**	**803**	**0.832124**
	M2	**SAFETY AND HEALTH STANDARD PROCEDURE (SOP)**	a	Outline and detail out the Standard working Procedure for specific construction works/activities at all stages/phases	0	0	38	68	87	**193**	**821**	**0.850777**
			b	implications of SOP on evaluation of HIRADC	0	0	33	59	101	**193**	**840**	**0.870466**

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			c	SOP in relation to guideline and code of practice, related Legislation, Act, rules and regulation	0	0	33	71	89	**193**	**828**	**0.858031**
			d	outline Frequency of Assessment/monitoring /supervision and enforcement of SOP	0	0	32	65	96	**193**	**836**	**0.866321**
			e	SOP for inspection, maintenance, management and requirement of PPE and related equipment	0	0	35	67	91	**193**	**828**	**0.858031**
			f	SOP for obtaining Competent Person requirement and responsibilities	0	0	40	76	77	**193**	**809**	**0.838342**
			g	SOP for Documentation and audit	0	0	29	65	99	**193**	**842**	**0.872539**
			h	SOP for House Keeping and maintenance at specific construction works/activities	0	0	34	73	86	**193**	**824**	**0.853886**
			i	SOP for Specialist Involvement at any specific construction works/activities	0	0	32	76	85	**193**	**825**	**0.854922**
	M 3	**INDUCTION TRAINIING MANAGEMENT ON SAFETY AND HEALTH**	a	describe schedule of induction training programmes and the application of relevant safety pass	0	0	34	74	85	**193**	**823**	**0.85285**
			b	valid documentation of Green Card holders and management of its implementation	0	0	41	73	79	**193**	**810**	**0.839378**
			c	outline scheduled frequencies on weekly basis of the Safety Training, campaign and promotion	0	0	39	71	83	**193**	**816**	**0.845596**
			d	describe management of documentation and assessment to maintain quality of training programmes	0	0	47	78	68	**193**	**793**	**0.821762**
			e	valid documentation of certified competent person to manage training and resource capabilities to conduct skill training	0	0	43	68	82	**193**	**811**	**0.840415**
	M	**EMPLOYEE**	a	outline scheduled Health	0	0	35	70	88	**193**	**825**	**0.85492**

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4	**HEALTH INSPECTION**		Campaign programme								**2**
		b	describe Scheduled health check up	0	0	42	81	70	**193**	**800**	**0.829016**
		c	describe health monitoring programme	0	0	41	67	85	**193**	**816**	**0.845596**
		d	describe environmental assessment on site	0	0	51	74	68	**193**	**789**	**0.817617**
M 5	**SAFETY PROGRAM FOR SUB-CONTRACTOR**	a	list of compulsory involvement/participation of the sub-contractor on specific safety programme	0	0	32	72	89	**193**	**829**	**0.859067**
		b	schedule coordination meeting involving sub-contractor on safety and health	0	0	25	95	73	**193**	**820**	**0.849741**
		c	describe the certification program that the sub-contractor need to participate as competent person/specific training requirement	0	0	43	84	66	**193**	**795**	**0.823834**
M 6	**TRAFFIC MANAGEMENT**	a	provide traffic management plan	0	0	30	75	88	**193**	**830**	**0.860104**
		b	outline proposal of conflict handling of traffic management in case of emergency	0	0	46	65	82	**193**	**808**	**0.837306**
		c	design traffic plan for emergency evacuation	0	0	44	75	74	**193**	**802**	**0.831088**
		d	describe and propose signage management and procedure	0	0	40	69	84	**193**	**816**	**0.845596**
		e	describe temporary traffic management outfit/tool	0	0	45	66	82	**193**	**809**	**0.838342**
M 7	**PERSONAL PROTECTION EQUIPMENT (PPE)**	a	outline the Purpose and objective of PPE related to construction activities/stages/phases	0	0	37	81	75	**193**	**810**	**0.839378**
		b	outline scheduled Briefing on PPE and its training programmes	0	0	40	69	84	**193**	**816**	**0.845596**
		c	provide technical data and documentation of specification, compliance and/or certification according to specific construction works/activities/stages/phases	0	0	45	71	77	**193**	**804**	**0.833161**
		d	provide enforcement management system for inspection, assessment,	0	0	42	80	71	**193**	**801**	**0.830052**

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				monitoring and supervision maintaining the fitness of all PPE in standard working condition at all time									
			e	describe in detail the Functions and allocation of each PPE designated to specific construction works/activities/stages/phases	0	0	41	66	86	**193**	**817**	**0.846632**
ANALYTICAL ASSESSMENT	**A1**	**HAZARD IDENTIFICATION, RISK ASSESSEMENT DETERMINING CONTROL (HIRADC)**	a	prescribe specific scope of construction works/activities within the context of hazard identification of its type, effect and control strategy	0	0	43	78	72	**193**	**801**	**0.830052**
			b	analyse and determine the level risks (1-25) within the influential context of likelihood (1-5) and severity (1-5) implications	0	0	45	73	75	**193**	**802**	**0.831088**
			c	provide risk control management compliance with the related legislation, act, rules and regulation	0	0	37	79	77	**193**	**812**	**0.841451**
			d	competent Person-In-Charged (PIC) to deliver the management of HIRADC with certification and/or industrial experience	0	0	44	76	73	**193**	**801**	**0.830052**
	A2	**FIRE PREVENTION AND PROTECTION PLAN & EMERGENCY RESPONSE PLAN**	a	detail out the Emergency Classification in response to HIRADC analysis within the context of emergency level identification (1-3), Emergency Escape Priority Plan (1-4) and analysis of potential causes of emergency	0	0	42	74	77	**193**	**803**	**0.832124**
			b	Emergency Action Plan (EAP), Emergency Evacuation Plan and Emergency Response Standard Procedure	0	0	37	75	81	**193**	**816**	**0.845596**
			c	prescribed in depth the Emergency Response Plan (ERP)	0	0	31	66	96	**193**	**837**	**0.867358**

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			d	prescribed in depth the Emergency Response Team (ERT) complete with the assigned competent Person-In-Charged (PIC)	0	0	32	80	81	**193**	**821**	**0.850777**
			e	outline the management of potential hazardous material	0	0	38	74	81	**193**	**815**	**0.84456**
			f	describe the scheduled inspection, supervision and monitoring enforcement, and compliance of the electrical infra system	0	0	33	68	92	**193**	**828**	**0.858031**
			g	describe the management of Fire Fighting Equipment complete with training schedule, inspection, indicative location, accessibility and maintenance programmes.	0	0	43	70	80	**193**	**809**	**0.838342**
	A 3	**REPORTING AND INVESTIGATION ON ACCIDENT/INCIDENT**	a	procedure for accident report and investigation	0	0	43	72	78	**193**	**807**	**0.836269**
			b	flow chart on accident/incident management	0	0	27	74	92	**193**	**837**	**0.867358**
			c	presented format of report documentation	0	0	36	77	80	**193**	**812**	**0.841451**
			d	Role of responsibilities of parties involved, including ERT and ERP	0	0	36	74	83	**193**	**819**	**0.848705**
			e	describe the methodology to analyse the source of accident/incident	0	0	37	70	86	**193**	**817**	**0.846632**
			f	describe the analysis of CQI and its management	0	0	43	76	74	**193**	**799**	**0.827979**
	A 4	**STATISTICAL RECORD ON ACCIDENT, INJURIES AND ILLNESS**	a	describe the methodology and format to Classify (from major to minor) the type of accident, injuries and illness in time based	0	0	34	88	71	**193**	**809**	**0.838342**
			b	describe the format of presenting and evaluating causes of accident, injuries and illness	0	0	31	68	94	**193**	**835**	**0.865285**
			c	describe the format of presenting and evaluating total accumulative of reported cases	0	0	52	74	67	**193**	**787**	**0.815544**
			d	describe the format of presenting and evaluating statistical data on site	0	0	43	71	79	**193**	**808**	**0.837306**

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			e	outline the process and procedure of documentation of information and forwarding for meeting	0	0	31	71	91	**193**	**832**	**0.862176**
			f	describe the methodology to analyse findings of the statistical result for CQI	0	0	39	80	74	**193**	**807**	**0.836269**
FACILITIES AND INFRASTRUCTURE	**F 1**	**TEMPORARAY ELECTRICAL SUPPLY**	a	provide installation procedure, drawing and documentation approved by competent person	0	0	48	73	72	**193**	**796**	**0.82487**
			b	outline the guideline and code of practice, related Legislation, Act, rules and regulations for construction works, connection and installation	0	0	32	77	84	**193**	**824**	**0.853886**
			c	outline material specification and design requirement approved by competent person	0	0	44	70	79	**193**	**807**	**0.836269**
			d	provide valid documentation of certified competent person for electrical works	0	0	45	68	80	**193**	**807**	**0.836269**
	F 2	**SANITARY FACILITIES**	a	provide waste management system approved by competent person	0	0	49	71	73	**193**	**796**	**0.82487**
			b	provide installation procedure, drawing and documentation as approved by competent person	0	0	39	73	81	**193**	**814**	**0.843523**
			c	comply with guideline and code of practice, related Legislation, Act, rules and regulation	0	0	41	74	78	**193**	**809**	**0.838342**
			d	outline the specification and design requirement as approved by competent designer, local authorities/government	0	0	31	75	87	**193**	**828**	**0.858031**
			e	provide valid documentation of certified competent person	0	0	38	75	80	**193**	**814**	**0.843523**
	F 3	**OTHER FACILITIES**	a	design to meet the requirement of the employee. Provide evidence of survey and	0	0	35	71	87	**193**	**824**	**0.853886**

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				employee responses/feedbacks									
			b	details of installation procedure, drawing and documentation as approved by competent person	0	0	46	68	79	**193**	**805**	**0.834197**
			c	comply to guideline and code of practice, related Legislation, Act, rules and regulation	0	0	37	75	81	**193**	**816**	**0.845596**
			d	describe the specification and design requirement that comply with all designated requirement	0	0	32	68	93	**193**	**833**	**0.863212**
			e	provide valid documentation of certified competent person	0	0	31	82	80	**193**	**821**	**0.850777**
COMMUNICATION ADMINISTRATION	**C 1**	**COMMUNICATION INVOLVEMENT**	a	outline methodology of delivering safety and health information	0	0	35	83	75	**193**	**812**	**0.841451**
			b	provide the management of documentation of safety and health related information	0	0	36	71	86	**193**	**822**	**0.851813**
			c	outline schedule of safety meeting; initial, development, co-ordination, head department, site safety committee and client meeting	0	0	33	67	93	**193**	**832**	**0.862176**
			d	outline CQI for safety information management system	0	0	30	69	94	**193**	**836**	**0.866321**
	C 2	**PUBLICITY ON SAFETY AND HEALTH PROGRAM**	a	describe the methodology of Publicity medium and channels	0	0	39	68	86	**193**	**819**	**0.848705**
			b	outline schedule of safety programmes in weekly basis	0	0	38	73	82	**193**	**816**	**0.845596**
			c	outline frequency of safety programmmes according to the specific requirement	0	0	36	77	80	**193**	**816**	**0.845596**
			d	describe in detail each categories of safety programme	0	0	39	76	78	**193**	**811**	**0.840415**
	C 3	**SAFETY AND HEALTH MEETING**	a	list out and describe all type of safety and health meeting and its objective/purpose and	0	0	39	75	79	**193**	**812**	**0.841451**

				members									
			b	outline schedule and frequencies of each meeting	0	0	36	75	82	**193**	**818**	**0.847668**
			c	prescribe the management of information and documentation of each meeting	0	0	46	72	75	**193**	**801**	**0.830052**
			d	provide means of CQI after meeting and its management	0	0	28	71	94	**193**	**838**	**0.868394**
INFORMATION	**I 1**	**MATERIAL SAFETY DATA SHEET (MSDS)**	a	provide documentation of the information on the potential hazards	0	0	32	70	91	**193**	**831**	**0.86114**
			b	provide information on the use, storage, handling and emergency procedures	0	0	39	68	86	**193**	**819**	**0.848705**
			c	recognition of overexposure symptoms and what to do if such incidents occur	0	0	33	75	85	**193**	**824**	**0.853886**
			d	describe the management and accessibility of documentation	0	0	37	79	77	**193**	**812**	**0.841451**
			e	provide valid documentation of competent Person-In-Charged (PIC)	0	0	29	73	91	**193**	**834**	**0.864249**
	I 2	**CHEMICAL SAFETY DATA SHEET (MSDS)**	a	information on chemicals, describing the hazards the chemical presents	0	0	35	71	87	**193**	**824**	**0.853886**
			b	information on handling, storage and emergency measures in case of an accident	0	0	43	78	72	**193**	**801**	**0.830052**
			c	information on safe handling, in the form of exposure scenarios	0	0	35	79	79	**193**	**816**	**0.845596**
			d	advice on risk management measures given in the exposure scenario	0	0	43	79	71	**193**	**800**	**0.829016**
			e	outline the management and accessibility of documentation	0	0	41	80	72	**193**	**803**	**0.832124**
			f	valid documentation of competent Person-In-Charge (PIC)	0	0	47	80	66	**193**	**791**	**0.819689**

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	I 3	**MACHINERY EQUIPMENT LIST**	a	provide technical list of all machineries, contract vehicle (rental) such as type of machinery, model, engine capacity	0	0	40	84	69	**193**	**801**	**0.830052**
			b	management of inspection, service manual and maintenance schedule	0	0	41	75	77	**193**	**808**	**0.837306**
			c	valid record of drivers with competent license	0	0	39	81	73	**193**	**806**	**0.835233**
			d	vehicle permit and taxes documentation	0	0	38	79	76	**193**	**810**	**0.839378**
			e	valid documentation of certified competent person	0	0	36	69	88	**193**	**824**	**0.853886**

Table 2 shows the demographic of participants in the survey. They consist mainly of contractors and developers involved with government projects with several government safety officers and personnel taking part. Age of the participants does not factor much into the analysis as long as they are older than 25 years old. As noted previously, any participants aged 25 years old and below or having less than 1 year of working experience in safety and health are omitted to increase the reliability of the data collected.

Table 2. Demographic of Survey Participants

Description	Age		Experience Level		Representative
Below 25	N/A	1 year	N/A	Main Contractor	71
25-30	70	1-3 years	76	Sub-Contractor	75
31-40	80	3-5 years	77	Developer	35
41-50	42	5-10 years	44	Government	12
Above 50	1	More than 10 years	1	Others	0

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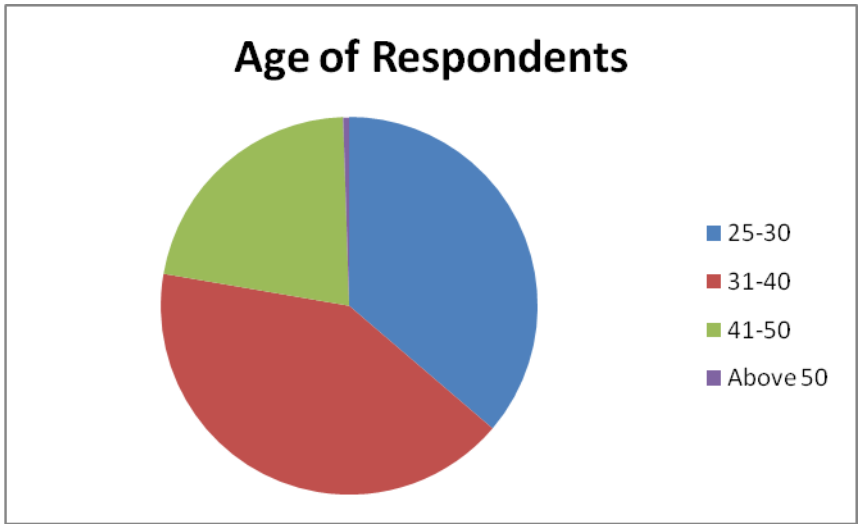

figure 7. Age Breakdown of Respondents

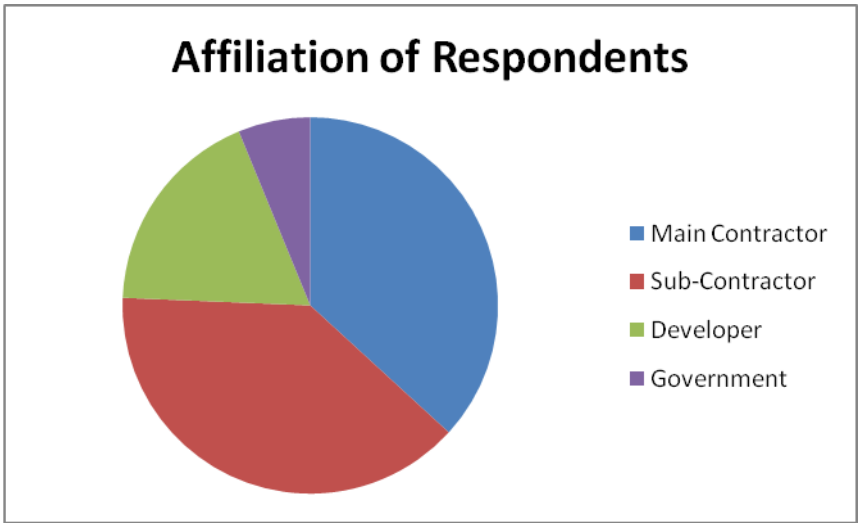

figure 8. Affiliation Breakdown of Respondents

After all of the weightage value are obtained, all of the value from each categories are summed up to obtain the percentage of representation and ranked them from highest to lowest. It can be seen that Management obtained the highest percentage due to the amount of details and itemization required for this category. It is assumed that the more items is required for clarification in the assessment tool, the more important the category is. However, due to the required holistic approach of safety and health, all of the factors must be taken into account for the final scoring in order to avoid any bias towards certain approach to safety and health implementation.

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Table 3. Result of Survey from Safety Personnel

Category	Weightage Percentage
Management	28.7%
Analytical Assessment	18.8%
Information	13.1%
Facilities and Infrastructure	11.5%
Policy	9.9%
Communication Administration	9.9%
Legislation	8.1%

5. CONCLUSION

The primary objective of the research is to design a benchmarking strategy model to assess potential contractors based on the performance of safety and health of their previous projects. In theory, this will allow a more transparent selection process for government and also the contractors involved. Placing emphasis on how well the contractors have performed in terms of safety and health implementations will also push for a more direct focus on safety instead of being an afterthought for project requirement.

Based on the data obtained from both the expert panel and survey, it is shown that the proposed assessment tool allowed a more thorough and detailed review of the projects' performance in terms of safety and health implementation by breaking down each elements of the SH plan into separate categories.

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